ANUMUKTI

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Nucleocrats are a hard lot to please. First, they say, the nuclear issue is too complicated for the comprehension of the general mass of the people — the nominal masters in this "world's largest democracy". In fact, their claim is that the subject is too difficult for anyone, howsoever intelligent, who is not a "trained nuclear scientist," to understand. The only exceptions to this universal rule of general ignorance, are their political masters in the act of sanctioning vast hordes of money - larger than any king's ransom - required for the continuation of nuclear activities. Of course, these worthies only begin to understand nuclear complexities the very moment they enter the government and singularly fail to do so while in the opposition: but that is another story. The fact remains according to nucleocrats' often stated view: nuclear power is a subject meant only for experts and only they should be allowed to express any opinions on it.

Well, here we have a professor of engineering, (see box) a person who has, moreover, specialized in nuclear engineering from IIT Kanpur (no less!), who says that nuclear energy is irrelevant in the Indian context. It cannot meet the real energy needs of the people. The country ought to develop non-conventional alternative sources of energy and not waste time and resources running after the nuclear mirage. There is nothing very radical or 'subversive' in this opinion. Innumerable people all over the world have, of late, been saying similar things. It is, but for nuclear and bureaucratic circles, almost the accepted paradigm. The only mild surprise is that it is an 'expert' who is saying it. But then experts are people tool And people with courage of their convictions, though rare are not yet extinct.

Now one would naturally expect that the nuclear establishment would welcome this rare chance of being able to debate with someone knowledgeable rather than with ignoramuses like the rest of us. Moreover, this is in the context of setting up of a nuclear power station in Kerala — and it could be an excellent opportunity for a "learned" debate for educating public opinion. So, what does the nuclear establishment do. It acts true to form: like a terrorist it strikes at the person rather than the idea.

Once, during my earlier incarnation as a physicist, I was attending a seminar organised by the Department of Atomic Energy. One of their big-shots was giving a talk. He made, what I felt was an erroneous statement (in straight words his physics was wrong). I questioned him about it. As soon as the talk ended, he started making enquiries (from others) regarding where and with whom did I work. I enlightened him on these points myself. Later on, others from the 'department' came and said to me: "Why did you do that? He was obviously displeased by your questioning. He is a powerful person and he will try to harm your career." It was at that moment, that I decided that an establishment which consisted of such petty, vindictive and moreover ignorant characters needed to be exposed through full-time active opposition.

For the safe operation of nuclear installations in the country, even for its safe dismantling, it is absolutely necessary that persons manning the nuclear installations do not have the "nuclear mindset". The commission which investigated the Three Mile Island disaster of 1979 made the following observation:

> *"To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, practices and above all in the attitudes of the nuclear industry. The belief that nuclear power plants are sufficiently safe has grown into a conviction. One mus: recognize this to understand why many key steps that could have prevented the accident were not taken. The Commission is convinced that this attitude must be changed to one that says nuclear power is by its very nature potentially dangerous, and, therefore one must continually question whether the safeguards already in place are sufficient to prevent major accidents."*

Therefore, the need for independent critical expertise is fairly obvious. People who could and would question ideas, designs, operational procedures and sometimes maybe even the relevance of the nuclear enterprise. An organisation interested in the proper running of its plants would try to promote the emergence of such expertise within the system. But, instead what we have in India is an establishment organised somewhat like the army. Obedience to 'superiors' is the keyword. All recruitment of officers is done through the BARC training school. The trainees know that those who are their seniors shall remain their superiors all throughout their careers since the only avenue open for employment are the various establishments run by the DAE.

Not satisfied with keeping its own 'soldiers' well in line, the nuclear establishment tries its utmost to ruthlessly stamp out dissent anywhere in the scientific community. The action against Prof. Menon is not an isolated instance. DAE has systematically tried to undermine the credibility of the only nuclear engineering programme (at NT Kanpur) outside its own control. Of the 47 M.Tech. graduates till 1987, only one had been absorbed by any DAE run unit.

It is a great pity that nucleocrats have to a large extent succeeded in their design of keeping the Indian scientific community in a state of docility. It is in vain that one looks for any sign of outrage or protest from scientific bodies like the academies at DAE's arbitrary high-handedness.

It is not only the right but in fact the duty of the scientists to inform and educate the public on life and death issues raised by the application of science for the 'service of man'. No bureaucrat should ever be allowed to use the pretext of 'service rules' to bludgeon an independent minded scientist into silence. Freedom needs zealous guarding.

Surendra Gadekar

Scientist Sacked for Criticising Nuclear Plants

Prof.R.V.G.Menon has been relieved of his charge as director of the Agency for Non-conventional Energy and Rural Technology, for 'embarrassing' the Government by openly airing his views against nuclear power plants in the State.

He had published his opinion in a local Malyalam daily and magazine as a sort of rejoinder to Atomic Energy Commission chairman Dr.P.K. Iyengar's statement at a news conference in Tiruvanthapuram early this year. The Government sought Mr.Menon's explanation for violating the Government servants conduct rules and going to the press without getting its prior sanction. The Government order said that Mr.Menon's statements have landed it in an embarrassing situation.

Mr.Menon, who had been given a two year extension at the end of the first term in March this year, has been reverted as professor in the mechanical engineering department of the College of Engineering, Thiruvanthapuram.

When contacted, Mr.Menon said: "I still feel what I have done is correct. I will continue to express my opinions fearlessly in the future also". He said that it was out of conviction and experience after obtaining an M.Tech. in nuclear engineering from I.I.T. Kanpur, that he had been advocating the cause of non- conventional energy in the past 20 years.

He could not fail in his basic duty towards the public, who will be the ultimate victims or beneficiaries of nuclear energy.

AEC chairman, Dr P. K. Iyengar, during his press conference had asked people like Justice V.R.Krishna Iyer not to sit In judgement on a subject that should be decided by scientists and experts. Dr Iyengar had also predicted that the proposed thermal plant at Kayamkulam would be more dangerous than a nuclear installation. It was in these circumstances, especially when a public debate was on, that he wanted to present the other viewpoint, Mr.Menon said. Referring to the Governments action, Mr Menon said his understanding of the rules was that Government servants can express their opinions in public on issues of a purely literary and scientific nature. "And I have not overstepped that limit", he said.

Indian Express August 1, 1990

Economic Miracle: Ecologic Disaster

By conventional economic measures, Taiwan's success is undeniable: at $7,000, Taiwan's per capita income has overtaken that of some members of the European Community. The economic growth rate has averaged close to 9% per year over the last 30 years, outpacing everything but the speed of environmental destruction. Today, most Taiwanese are wondering if material benefits of high speed growth are not, in fact, outweighed by its costs. The people are increasingly refusing to tolerate two of the basic ingredients in the recipe for high speed growth: low wages and environmental degradation. There has been a rapid increase in labour disputes during the last three years and the influence of neighbourhood environmental activists has been on the ascendent among all sectors of the Taiwanese society and now poses a potent challenge to the technocrats' ideology of the primacy of growth.

Taiwan's landscape is as enchantingly green now as it appeared to the Portuguese seamen who christened it Formosa', or "Beautiful Island". But beneath the greenery is poisoned soil. Besides the greenery flows polluted water. And, increasingly, the green itself is toxic grain.

Undoubtedly the greatest potential threat to the environment in Taiwan is nuclear power. Taiwan now has three nuclear plants; if the technocrats had had their way, the island would have been inflicted with a plan to build 20 by the year 2000. Rising public opposition, however, has stymied government plans to build a fourth plant, and the growing space for democratic discussion has pushed the public into taking a more critical view of the whole nuclear power programme.

The nuclear power programme may not serve the interests of the Taiwanese people, but it does serve several powerful domestic and foreign interests:

The Foreign Vendors

Taiwan proved to be a lifesaver for a US nuclear industry that was threatened with extinction as a result of the loss of its domestic market in the late 1970s and 1980s. With tight repression by the KMT(Kuomintang) government curbing antinuclear sentiment, the nuclear monopolies were able to carve up the Taiwanese energy market. This 'gentlemen's agreement' is clear from the pattern of contracts: General EIectric supplied the reactors for plants Nos. 1 and 2—the Shihmin Hsiang and Kuosheng sites outside Taipei—and generators **for** plant No.3 at Maanshan. Competitor Westinghouse, meanwhile, provided the reactor for plant No.3 and the generators for Nos.1 and 2. San Fransisco based Betchel corporation provided the architectural and engineering services for plants Nos.2 and 3.

The KMT-Business Elite

Realpolitik entered Taiwan's nuclear equation in the fallout of the US decision to cut off diplomatic relations with Taiwan and recognize the People's Republic of China. Seeking to replace severed diplomatic ties with tighter economic ones, the KMT- business elite saw nuclear energy development as a way to induce prestigious US corporations to increase their economic interests in Taiwan. With the nuclear vendors and other US firms securely anchored on the island, the KMT correctly reasoned, the US government would hesitate to cut off all military and political ties.

The Technocrats

Nuclear power plants provide an opportunity for centralized bureaucratic control unmatched by any other energy technology: already, just three nuclear plants supply over 53% of the electricity generated on the island. Thus Taiwan's technocrats are a natural constituency for nuclear power. Centralization of Taiwan's energy supply is conducive to the technocrats' visions of state-guided high-speed growth. And centralized power production concentrates more economic and political power in their hands.

The Military

The opportunity to reprocess spent fuel from reactors to make weapons grade plutonium has made Taiwan's military a natural ally of the nuclear energy programme. The military's active persuit of the nuclear weapons option is one of the more dangerous elements of the hostility between the KMT government and the communist government on the mainland. Two controversial incidents have highlighted the link between the 'peaceful' nuclear power programme and nuclear weapons. The most recent was the defection to the United States in 1988 of a Taiwanese colonel, Chang Hsien- Yi who served as a deputy director of the Nuclear Energy Research Institute (NERI) of the Chungshan Institute of Science & Technology, the top military research centre and part of the Defense Ministry. Identified as a CIA informant, Chang is said to have divulged information that led to US pressure to demand the demolition of a secret nuclear research facility in 1987. A similar incident occurred ten years earlier, when

NERI was forced to destroy its nuclear-waste programme after a researcher provided documents to the US.

Towards a Taiwanese Chernobyl?

Safety issues are a special concern to Taiwan which is one of the most densely populated countries in the world. Taiwanese nuclear power experts argue that the greatest threat to nuclear safety in Taiwan is not human error — the cause of both Three Mile Island and Chernobyl disasters — but external events such as earthquakes and typhoons. Even if one were to accept this assessment at face value, there are strong grounds for questioning the soundness of the nuclear energy programme, since Taiwan is regularly battered by typhoons and lies along the so-called 'Pacific Fire Belt', a ring of intense tectonic and volcanic activity. Indeed, the Shihmin Hsiang and Kuosheng power plants, just 12 miles from Taipei, are said to be situated at the edge of the active Ta-Tun volcano group and amid a maze of earthquake fault lines.

But typhoons and earthquakes are not the only problems. The arrogant insistence by Taipower, the state energy monopoly, that no problems ever have or ever will exist at any of its plants, contrasts sharply with widely published accounts of radiation leakages, accidents and cover-ups. In July 1985, a fire at nuclear power plant No.3 forced the suspension of operations for 15 months and caused damages valued at $300 million. So alarmed were the local residents that they organized meetings and rallies to demand safer emergency and evacuation plans and compensation for the surrounding communities. Another fire broke out at the same plant in August 1987. According to one report, Taipower tried to cover-up a major radiation leak at plant No.1 in January 1986, apparently the second accident at the plant within a year. J.Sprague in the July 1988 issue of *Bang* caustically noted:

> *"Over 1985 and 1986, Taipower's No.1 nuclear plant set a world record for continuous operation, 418 days without a shutdown ...In March 1988, local newspapers accused plant No. 1 of having set up another world record, 56 days of continuous radiation leakage outside the plant — from September 3 to October 28, 1985. Taipower denied the charge but Taipower's credibility is at a low ebb right now."*

In February 1988, a generator at the No.1 plant shut down automatically for unknown reasons, later discovered to be computer error. Two fuel pellets were stolen from No.3 plant, then found a few days later. Plant repair logs are sometimes incomplete or missing altogether. Perhaps not unrelated to these mishaps is the inadequate training of plant personnel. While many of the best trained nuclear operators are creamed off by US firms and transferred to the US, 40% of the skilled workers in Taipower's nuclear plants are underqualified for the tasks they perform. Most reports of plant safety violations are reported by nuclear plant workers who are upset by their dangerous working conditions. In May 1988, 200 maintenance workers at plant No.1 walked through a puddle of radioactive water the plant manager knew was there. One Taipower engineer filed a lawsuit charging that the exposure to radiation made him ill, but lost the case because pertinent records were found to be missing.

Mismanaging Waste Disposal

There is a surreal quality to Taipower's record and plans in the area of radioactive waste disposal. Children in Taoyuan, near Taipei, had been playing for weeks on a pile of scrap metal near their elementary school before it was discovered to be radioactive. Old parts of nuclear plants exposed to intense radiation were said to have been sold as scrap metal, then recycled into metal for new buildings. An underground low level depository which Taipower built on Lan Yu (Orchid Island), 40 miles from Taiwan's southeast tip, lies on an earthquake fault line. Despite protests by the Yami aborigines who inhabit Lan Yu, Taipower plans to build a second low-level waste dump on the lush nine square mile island — plus a 247 acre park above the dump, including a hall with exhibits extolling the virtues of nuclear energy.

Spent fuel is currently stored at reactor sites. But this is only temporary: a location must be found which can hold the material for the hundreds of thousands of years that they are radioactive. No viable solution, except perhaps shipping the waste out of Taiwan, may ever be found.

> *"Taiwan is an extremely densely populated island. It is virtually impossible to find a site which would be remote enough that a long-lived radionuclide can be isolated from the human environment. In addition, because Taiwan is a small island, marine life is a vital component of food. Therefore, the ocean surrounding Taiwan and all the nearby small islands are virtually an integral part of the human environment. In other words, small islands outside of Taiwan, no matter how small their present population, cannot be considered 'remote'... Due to its extremely active tectonics, Taiwan has a very complex geology. It is difficult to find a basaltic or shale formation that is continuous, homogeneous stable and big enough to accommodate high level wastes. Last, but not least, Taiwan's subtropical weather conditions call for special attention on studying hydrological (both surface and underground) problems."*

The Growth of the Environmental Movement

Taiwan's technocrats' stubborn efforts to ram through the building of more nuclear power plants despite Three Mile Island and Chernobyl has spawned a strong antinuclear movement. A key event was a well-publicized seminar sponsored by the Consumers' Foundation in April 1985, which brought together a number of scholars and intellectuals opposed to the building of the fourth nuclear power plant. The fledgeling antinuclear sentiment sparked by this meeting was boosted shortly thereafter by the July 1985 tire at plant No.3 and the Chernobyl disaster in April 1986. The grassroots antinuclear movement has evolved along the decentralized pattern obtaining elsewhere. This network of 'antinuclear self-help associations' has so far successfully stymied the construction of plant No.4, leading a frustrated Taipower to hire the British public relations firm Ogilvy and Mather to promote nuclear power to an increasingly sceptical public.

The antinuclear movement, however, is just one prong of a broader environmental movement. Aside from forcing the suspension of the fourth nuclear power plant, this decentralized but increasingly powerful movement has stopped Dupont Corporation constructing a $160 million titanium oxide plant and forced the closure of a major petrochemical plant owned by the British transnational ICI which fishermen had accused of dumping acid waste in their fishing grounds. Averaging one anti-pollution demonstration a day during 1987-88, the movement represents the rejection on part of increasing number of Taiwanese of the KMT's reckless persuit of growth.

Through its militant mass actions, the environmental movement is bringing home the message that a radical transformation of Taiwan's priorities is in order. Such token measures as the establishment of a 900-person Environmental Protection Agency are no longer sufficient, say the critics. The growth rate must be radically lowered. The controversial *Taiwan 2000* report asserts that even if the annual rate of Taiwan's GNP growth were cut to 6.5 per cent, the stress on Taiwan's already fragile ecosystem would double by the year 2000.

Will this perilous prospect prove ultimately persuasive to KMT technocrats? Some Taiwanese environmentalists are sceptical, for they feel that there is more to the conflict than the clash of contrasting visions of Taiwan's future between the largely Taiwanese environmentalists and the Mainlander dominated KMT elite. According to Hsu Shen-Shu, founder of the New Housewives Association, which has forged links between the emerging feminist and environmental movements:

> *"Current policy makers do not love this place as their home since they still operate under the myth of returning to the Mainland and have not changed their basic opinion of Taiwan as a temporary stop, a hotel of sorts. After benefitting from the exploitation of the island, they send their children to the States because it is too polluted here in Taiwan."*

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The feelings expressed by Hsu are widespread, and they indicate that the day may not be far off when the KMT, with its policy of export-oriented growth at any cost, is finally evicted by the people of Taiwan.

Walden Bello and Stephanie Rosenfeld

This article is taken from the authors' *Dragons in Distress: Crisis and Conflict in Asia's Miracle Economies.* We have excerpted this bit from *The Ecologist* Vol.20 No.4, July/August 1990

Glasnost Mark n at Tarapur

The Bombay Sarvodaya Mandal along with 12 other organisations had organised a protest rally at Tarapur and Boisar on 6th of August, 1990. About 150 people participated in the rally. Of these around 50, mainly young men and women, had come from Bombay while others were representatives of local activist organisations and trade unions. Four of us had journeyed from Vedchhi as representatives of Sampoorna Kranti Vidyalaya and *Anumukti*

I was part of a delegation from amongst the protesters who went to give a memorandum to senior nuclear plant officials. The memorandum addressed itself to four main themes:

- The absence of any coherence in the nuclear power generation policy. Earlier, DAE used to shout the virtues of self reliance, but nowadays it is busy signing deals for the import of outmoded foreign technology.

- Environmental radiological pollution.

- Misdirection of scarce resources better spent on development of alternative energy sources

- The veil of secrecy surrounding atomic energy activities.

The memorandum demanded from the Government that:

- They appoint an independent commission to investigate radiological pollution around nuclear power plants and conduct a health audit of the surrounding villages.
- Section 18,19 and 20 of the Atomic Energy Act of 1962 be amended forthwith.
- A moratorium be declared on further plant construction.

On our way to the administrative building, we saw a group of employees sitting outside. We wanted to give them some antinuclear literature but were prevented from doing so. When I protested, I was told it was for 'security reasons' and due to the need to maintain discipline. "You see, we do not allow anybody to distribute any pamphlets inside the plant. That will just encourage unionism."

We were led into an air-conditioned conference room. There were more than ten people already seated at the back of the room. We were met by three plant officials. Our names were noted down. On my asking them for their names, only these three introduced themselves. "What about the others?" "Oh, they are just security men", was the answer. I wondered if the security men were there to secure the officials from us or from themselves, but I did not say this aloud.

Shri Kumar Prashant on our behalf said that we had not come to indulge in a debate on the merits or otherwise of nuclear energy with them. We deplored the secrecy surrounding the nuclear activities in the country and merely desired to exercise our right to information regarding them. The reply to this was that they were indeed a very open organisation. There was no question of secrecy at all. As proof of this bizarre statement, they pointed to the fact that they had allowed us in and had indeed made all the arrangements (including refreshments!) to welcome us.

Thanking them for their generous hospitality, I asked for a copy of the latest performance report.
"Performance report! What is that?"
"You know as well as I do what a performance report means! The document which contains reports on performance since the start of commercial operation, a detailed analysis of shutdowns and accidents, radiation levels and activity discharges, financial performance, etc."
"No, I cannot give you that since that is a policy matter."

"Could you show me the health records of your regular employees and their families?"
"No, I cannot give you that since that is a policy matter."

"What about the health records of the daily wage earners and their families who were made to do 'dirty' jobs involving high doses of radiation and then discharged after getting 'burnt- out."
"We don't keep records of the health of workers after they leave our employment. So, the question of our keeping health records of their families just doesn't arise."

"Have you conducted health surveys of the people living in the vicinity of the plant?"
"No health surveys have been carried out. Anyway, it is none of our business or concern."

"You can at least give us a copy of the emergency preparedness plan. It after all affects the public in the most vital and direct way."
"No, that is the DM's duty. We have conducted three day camps for training civil servants and taught them the procedure to be followed in an emergency. We have also printed copies of the emergency preparedness plan. But I cannot give you a copy since that is a policy matter."

So their much vaunted openness extended only up to tea and refreshments. But we could not partake of those since that was a policy matter with us.

On our return to Boisar — the railhead near Tarapur — we found that all our colleagues had been arrested for defying prohibitory orders but they were conducting a very lively public meeting from the compound of the police station and about two to three hundred people were listening to the speeches standing outside the boundary of the station.
Sanghamitra Desai Gadekar
Sampoorna Kranti Vidyalaya, Vedchhi

Hiroshima Day at Udaipur

Gandhi Peace Foundation had organised a function in the Seva Mandir compound to mark Hiroshima day on 6th of August, 1990. There was a small gathering of intellectuals who discussed both nuclear weapons and the nuclear energy issues. Many speakers emphasised the fact that both these issues were in fact only a single issue, since the 'peaceful atom could not be separated from the 'military atom'. The highlight of the day was a slide-show where both slides of people from Hiroshima as well as those of people living near the Rajasthan Atomic Power Plant at Rawatbhata were shown. There was a very lively discussion on the need for nuclear power in India.

Skeletons from Soviet Nuclear Cupboard

According to Russian nuclear engineer, Grigori Medvedev, the catastrophe at Chernobyl-4 in April 1986 had been preceded by more than ten serious accidents at other nuclear plants in the USSR, but information about them was hidden from all but very senior energy sector officials. In an article published in the US weekly *Nucleonics Week*, Medvedev suggests that this refusal to acknowledge major problems with Russian built reactors resulted in a belief on part of the Chernobyl-4 operators that a serious accident at their unit was simply not possible. In fact senior plant officials present at the control room on the night of 26th April stubbornly refused to believe that the reactor had exploded and sent operating staff repeatedly to inspect the ravaged core, thus condemning them to horrible suffering and death.

Further, says Medvedev, there were no dosimeters available that night to measure radiation levels above 1,000 millieroentgens (1 rad), leading plant officials to assure Moscow there was no radiological danger at Chernobyl, despite obvious radiation poisoning of operating staff returning from the central part of the plant. Medvedev reveals this in a new book about Chernobyl entitled *"The Chernobyl Chronicle"*, published by the Soviet writers' journal *"Noviy Mir"*, last year. An English translation entitled *"The Chernobyl Notebook,"* will soon be available from Basic Books in New York.

Medvedev worked for seven years at Chernobyl (on construction of unit 5) in the 1970s after having been transfered from the operational sector because of radiation exposure of 180 rad. Most recently, he was deputy in the central office for nuclear plant construction in the Ministry of Energy and Electrification which oversaw nuclear plant construction and operation before the Chernobyl accident. His book also contains a section about Hospital No. 6, the radiation illness facility in Moscow where he himself was treated following his exposure and where initially the survivors of Chernobyl were taken to for treatment.

Following is a list of 11 of the nuclear accidents Medvedev refers to, as published by *"Nucleonics Week* (31 May 1990):

September 1957. The now well known explosion of a liquid high level waste tank at Kyshtym defense reprocessing complex near Chelyabinsk. (See *Anumukti* Vol 2 Number 5) Large areas of land still remain off limits after decades.

May 7. 1966. Power excursion in the 62 MW prototype Boiling Water reactor at Melekess. A health physicist and a shift supervisor are irradiated. The chain reaction stops when two sacks of boric acid are thrown on the reactor.

1964—1979. Frequent destruction of fuel assemblies at Beloyarsk-1. Operating staff are irradiated during repairs to the core.

January 7. 1974. Explosion of a reinforced concrete tank containing radioactive gasses at Leningrad-1.

Febrauary 6 1974, Explosion of the tertiary circuit at Leningrad-1 from hydraulic shocks induced by violent boiling. Three persons died and highly radioactive water containing filter wastes was released into the atmosphere.

October 1975. Local core-mett at Leningrad-1. A day later over 1.5 million curies are released through the stack.

1977. Half of the fuel assemblies melt at Beloyarsk-2. Irradiation of staff during repairs which last over a year.

December 31SL..13I& Fire at Beloyarsk-2 caused by the collapse of the turbine building roof. The control cable is completely burned and the reactor goes out of control. Eight people are irradiated while trying to inject coolant into the reactor.

September 1982. Partial core-melt at Chernobyl-1 following an incorrect action by operating staff. Release of radioactive material into the industrial zone and the city of Pripyat; irradiation of staff involved in repairing the core.

October 1982 Explosion of the generator of Armenia-1 (VVER- 440), setting fire to the turbine building. The operating staff manages to keep the coolant flowing, and a team from the far-away sister plant at Kola arrives by airplane to help the Armenia operators save the core.

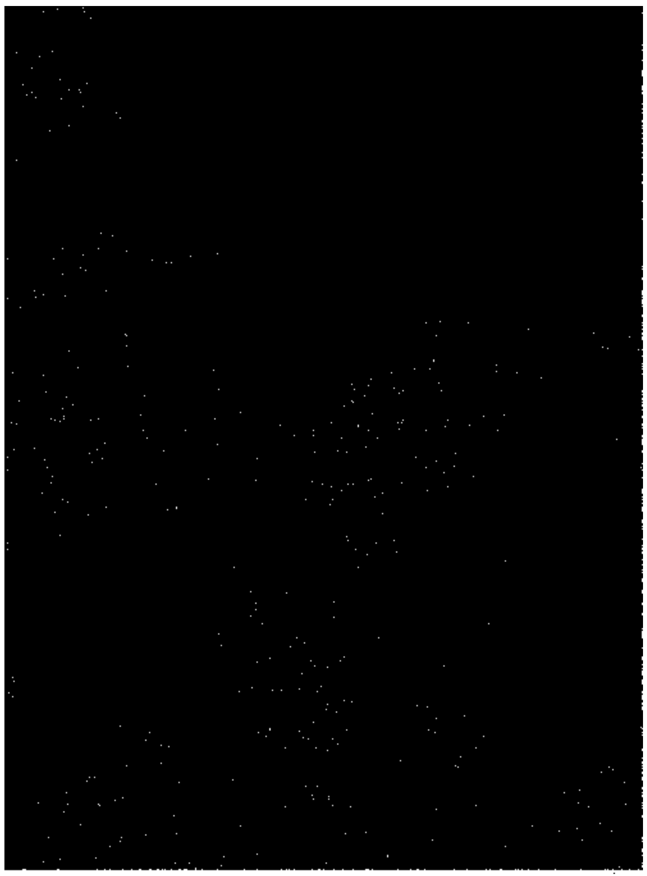
June 27. 1985. Accident at Balakovo-1 (VVER-1000) during initial start-up, when the pressurizer relief valve opens suddenly and steam at 300'C is sprayed into staff work areas. Fourteen people die. The accident is laid to errors on the part of inexperienced, nervous operating staff.
Source:
WISE New's Communique 334, 22 June 1990

Independent Verification

In our last issue we carried a report entitled "Chernobhata?" by Sanghamitra Desai Gadekar which claimed that people near the Rawatbhata atomic power station were seriously and abnormally ill and asked that a scientific investigation be immediately undertaken to determine the cause of these serious abnormalities. It is indeed gratifying to note that a national newspaper ***The Sunday Mail*** *has taken the trouble to send its reporters to the area to confirm our story. Their report appeared in the July 29th, 1990 issue of the newspaper and contains some excellent though heart-wrenching photographs. We reproduce the report in full along with some of our own photographs.*

Ramesh is a ten year old boy who developed a high fever a year back. Soon his body started developing tumours accompanied by undue loss of weight. His mother, Motian Bai, says that they mortgaged their land for treatment of their son. But it was to no avail. Ramesh's health has continued to deteriorate, and today he is so emaciated that he stands with the support of a stick. A sobbing Motian Bai says: "I don't know what has happened to the village in the last three years. People are constantly falling ill."

A few steps away from Motian Bai's hut, a 35 year old Balu Bhil sits forlorn. He has still not been able to come to terms with the amputation of his right foot. It had first started with an itch and then his toe started swelling. By the time he was taken to the hospital, the situation had come to such a pass that the doctors decided to sacrifice his right foot to save his life. His brother, Lalu, moans: "It is all because of that plant. We were very sturdy people. But all our illnesses must be due to radiation of the plant."



Balu Bhil and his feet

Radiation is indeed the only English word the villagers of Jharjhani know. They can't even con' t prehend its nuances. But they harp on the fact that the Rajasthan Atomic Power Station (RAPS) and Heavy Water Plant (HWP) at Rawatbhata have become the bane of their existence. The villagers appear to imbue supernatural power to the word, radiation. But are the villagers suffering due to radiation from the atomic stations? This is **hard to tell,** though some experts say that the reason probably lies in the pollution caused by the probable dumping of chemical waste than the radiation from the plant *per se.*

Recently, a team led by Dr. Sanghamitra Desai Gadekar, had visited these villages and had opined that such high incidents of tumour in a single village could only be ascribed to radiation. She had further claimed that the incidents of cancer among RAPS workers and their women folk can only be due to radiation, which has to be far more than the official claims.

Indeed the last three to four years has seen the birth of deformed children — a boy without an ear, a child without a hand, another with an overgrown skull and many with twisted legs. Some disconsolate women complain that children were born, did not grow an inch for the next six months and died subsequently. The villagers have stopped being surprised by such facts like a child with toes stuck together.

The elders are shocked by the way the children of the village start losing weight and fall ill. They complain that most of them too contact fever and skin diseases hitherto unknown to them.

It is indeed a village of disease and deformity. But Jharjhani is not the only place to be afflicted by mysterious malaise. For, a few kilometres away from RAPS the villagers of Tamlav have similar complaints. Chatturbhuj Singh, for instance, says that ailments of various kinds have become a feature of their existence only in the last five years. Said he: "It was never like this before. Now everyone complains of pains and skin problems."

The villagers of Jharjhani also point out that there has been a depletion in the number of livestock in the village. Kunwar Lal, who has been residing in the village for the last 25 years, said: "Not one of my hundred goats are alive today.

They all died one after the other in a span of three to five years." Chatturbhuj also points out that the number of cows has been dwindling over the last few years. Said he: "Only 500 cows out of 6,000 survive today."

Most villagers in unison blame RAPS and HWP for another new but depressing feature of their existence — weariness, body aches and lack of appetite. In fact, extreme weariness is one universal complaint of the villagers here. Said Madan Lal of Jharjhani: "We feel tired all the time." He and his friends say that even after a good sleep in the night they find it extremely difficult to get up in the morning. Madan says that even though their eyes open up early in the morning they are unable to get up from the cot because of extreme wean ness. "We find it bewildering. We are sturdy people who work in the field, but now we find it extremely cumbersome to raise ourselves from the bed," he explains.

Couldn't their complaints of illness and weariness be due to malnutrition? The villagers answer that neither their dietary habits have changed nor have the quantity of food intake. And then they ask: "But why were we not falling ill earlier? Why are our children increasingly being born deformed?"

In fact, the absence or lack of hunger and weariness is even the complaint of people residing in Rawalbhata town.

According to a top RAPS official, who agreed to speak but did not want his name to be taken as he did not have the permission from the ministry, said that he found it extremely surprising that they should be blamed for the present situation. "We have never conducted any tests on these villagers. But we do monitor our workers who are exposed to ten times more radiation than the villagers."

What does the medical data of RAPS show? It reveals that 30 workers or their children and wives have died of cancer ever since RAPS started operating in 1973. The approximate number of people who have worked in the staff is put around 4,000. What this official failed to mention was that there are another 10 people who have been reported to be suffering from cancer.

The official, however, clarified: "I must add that only one person can be said to have died of radiation. And anyway there is nothing abnormal with the number considering that the figure of cancer deaths at our plant is 1/4th of the national figure." But the fact according to Dr. Dhirendra Sharma, a professor at JNU, is that even a single death due to radiation is a matter of concern and provides ground for further investigation.

The official says that the plant cannot be said to have disrupted the life of the villagers as RAPS has increased the radiation in the environment only marginally. Said he: "The natural radiation in the environment was 80 mr and the plant has only increased it to 81 mr. Theoretically, contamination of the environment due to radiation is impossible. The diseases could be due to socio-economic factors." This official also said that RAPS workers, unlike the villagers, have never complained of weariness and bodyaches.

But this claim is pooh-poohed by the workers themselves. Most of them, however, were not willing to speak on record due to fear of retaliation from the management. But J.C.Gupta, a worker at RAPS, said: "I assure you that every one of us feel the same kind of weariness as complained by villagers. Besides they can hardly claim to examine the workers deligently. I have been medically examined thrice in the 18 years of my service at RAPS. The health of the workers has been deteriorating over the years. Like the villagers, there have been cases of deformed children being born to RAPS staff too."

While the workers allege that safety regulations are not adhered to and that some chemicals were dumped in the lake which supplies water to the village and the town, the official says that they have not violated any safety rules. He further pointed it out that it would probably be good to get the villagers examined and a survey conducted to put the controversy to an end. No one believes us, he complained.

Incidently, such medical surveys abroad are the combined responsibility of the Ministry of agriculture, environment and health. Shouldn't this be done in India too?

Ajaz Ashraf
Sunday Mail, July 29, 1990

CHERNOBYL:
A DOCUMENTARY STORY
Iurii Shcherbak
Canadian Institute of Ukrainian Studies
University of Alberta, Edmonton 1989

This little (168 pages) book is the first eyewitness account of the Chernobyl accident and the events succeeding it to reach us. It was first published in the Russian magazine *Iunost* in 1987. However, it was only in 1989 that an English translation was published by the Canadian Institute of Ukrainian Studies. The fact that this important bit of evidence has taken more than three years to come to our notice is a sad commentary on the 'global village'.

In some ways this delay has outdated some parts of the book. The writer, Dr Iurii Shcherbak, is a medical doctor and a successful author in Ukrainian with nine books already behind him. His humanism and his sympathy for the common people is apparent throughout the book. Also transparent is the fact that he is a communist and a believer in the inevitability of nuclear energy. Chernobyl to him is "the final warning". Humanity must change itself — (evolve in to a new breed *Homo-Nomistakus* - Editor) — to become fit to live in the nuclear age. As Dr. Shcherbak put it, "Man must learn to co-exist with nuclear energy". In the foreword to the book, it is mentioned that Dr Shcherbak is in the process of writing an expanded version. It would indeed be interesting to find out if the events in Eastern Europe as well as the unending nightmare of Chernobyl have made him change his views over the last three years.

This said, it must be admitted that this is indeed a splendid book, spellbindingly written. Great calamities are like a giant searchlight. They illumine both the good and the bad in human nature. Like Dickens said of the French Revolution —"It was the best of times. It was the worst of times."—It is not often that one gets a book that tries to describe both these aspects. Of course, Dr Shcherbak lays greater emphasis on the heroism and the self sacrifice rather than on the petty minded selfishness but that is as it should be. The words of simple folk -who did their duty without any fuss while staring death in the face, simply because the task had to be done - have an incredible strength and beauty and uplift the spirit.

No price"iS" mentioned on the book and it is a great pity that the book is not easily available in India.

Excerpt

"Myshko Holovnenko, the driver, set off without apause and I set out second. There are two engines in our brigade. I was in one and he in the other. Well, you know, it often happens that when we set out we don't close the doors, and the doors are glass, and often the wind breaks them. So, normally the one who comes out last must close them. Pryshchepa and I closed the garage. I thought to myself: I'll catch up with Myshko. I've got a ZIL-30. So off we went and I chased him around 80 Kilometres an hour. Above my head the walkie-talkie was cracking, he was calling Ivankiv and Poliske out, the traffic controller was calling us out. I could hear that this was a real alarm call. I thought that it was really something serious..."

"Then I caught up with Holovnenko's engine, so that there would be no confusion over the building, so that it would be two engines together at once. We drove up. As soon as we were there, we could see the flames. It was like a cloud with red flames. Pryshchepa said: "Well, grandad Hrysho, there will be lots of work." We arrived.lhere ten or fifteen minutes before two o'clock. We got out — where now, then? We surveyed the area. Graphite was scattered all around. Myshko said: "Graphite, whats all this?' I kicked it away. But a fireman on the other engine picked it up. "It's hot," he said. Graphite. There were various pieces, big and small, pieces you could take in your hands. They had fallen all over the road and we were trampling all over them. Then I saw Pravyk run up, the lieutenant who died. I knew him. I worked two years with him. And my son, Petro Hryhorovych Khmel, is a guard chief, just like Pravyk was. Pravyk was chief of No.3 guard, and Petro of No.1. They finished their education together.. .And my second son, Ivan Khmel, is the fire brigade inspection chief for the Chernobyl region."

"Yes, so Pravyk ran up. I asked him: 'What now, Voloda?" And he said: "Lets get the engines on the 'sukhotruby.' Over here." And now the engines from the brigades No.2 and No.6 came up and turned towards us. We had two and they had three tank trucks and a mechanical ladder. Five engines on this side. All together! We moved the engines up to the wall onto the 'sukhotruby'. Do you know what 'sukhotruby' are? No! They are empty hoses to which you have to connect the water and then drag them up there, on to the roof; and we had to take hoses, and join the hoses and put out the flames."

"We set the engine on the 'sukhotruby really close up, we had a very powerful engine, Petro Pyvovar's from No.6 on the hydrant next to it; there is no longer any room for mine there. Then Borys and Mylola Titenok and I said: "Let's have a hydrant!" Well, they found us one, and that was difficult at night. During training we knew that our hydrant was on that side according to the plan, but it turned out that it was on this side. We found the hydrant drove the engine up close, quickly threw the hose out, and they — Titenok and I think Borys, I can't remember — rushed forward to Myshko's engine. Three hoses twenty metres each, that makes sixty metres."

"We didn't have much idea about radiation. AN the workers didn't have any idea The engines delivered the water, Myshko filled the tank with water, the water went up and then those lads who died went up. They scrambled up there using the step ladder. I helped them set it up, and it was done very quickly, all this was done and 1 didn't see them again.

THE POWER OF THE POWERLESS

Ordinary people all over the world have suddenly realized that they cannot wait for governments to come up with solutions to the real problems of everyday life. In fact they have found that governments are a major cause of the problems in the first place. Thus, in the East as well as in the West, in the North as well as in the South, people are putting things right on their own. A few inspiring examples....

'Dissidents' in Power

Something quite new is happening in Czechoslovakia these days. It is not the collapse of the communist system to which I am referring, although this phenomena is of undisputed historic importance. It is, rather, what is taking its place. Under the leadership of President Vaclav Havel, playwright and humanist, simple and extraordinary, the "anti-politicians" (as they called themselves, the "dissidents," as we insisted on calling them) are taking over. How does an "anti-politician" function in the world of politics? The answer is stunningly simple: according to principle, the principles of fundamental humanism and individual moral responsibility.

The first acts and pronouncements of Havel and his new cabinet can serve to illustrate. For example: Havel has declared that Czechoslovak internal secret police are to be abolished and dismantled. Not reformed, not renamed, not justified according to any "reason of state," but simply disbanded —not to be replaced. The new Czechoslovakia has no need for a secret police to spy on its citizens. Contrast this simple and straightforward approach with the wrangles in East Germany over the very same issue (when the dreaded "Stasi" were apparently going to be reconstituted as "Nasi"), or in the United States, for the matter, where the surveillance of U.S. citizens by FBI has long been an issue of controversy.

Similarly, Jiri Dienstbier, Czechoslovakia's new Foreign Minister, has announced that Czechoslovakia will no longer be engaged in the production of weapons for export. No studies were commissioned to look into the ..question of lost profits (and they will be considerable: arms sales averaged close to a billion dollars per year for Czechoslovakia during the 1980s). Weapons manufacture is simply being stopped because it is inimical to the nature of the new state.

Perhaps most revealing of the depth of Havel's humanity and commitment to non-violent solutions was his "controversial" apology to Germans who suffered in the forced deportations of virtually all Germans (about three million people) from Czechoslovakia's Sudetenland at the end of World War II. Havel refuses to repeat the usual and popular justifications and excuses based on German atrocities against the Czechs between 1938 and 1945. His apology, like all his pronouncements is simple and exquisitely humane. In the same vein, Havel appealed to the Romanians to spare the life of toppled dictator Ceausescu and has spoken out in his own country strongly against vengeance on the communists.

How is it that Havel has remained so calm and assured in the midst of his sudden "elevation" from dissident to President? In an appearance on American television his brother, Ivan Havel, answered that Havel has *never* sought political office, and does not regard it as any sort of pinnacle in his life or career — or as fundamental to who he is. In short, being President has not changed him (as we can see from photographs of a familiarly rumpled and jean-clad Havel in his President's Office). The uniqueness of Czechoslovakia, even in the midst of all that is new in East Central Europe, is that rather than challenge the communist political ideology and structure with an alternative political ideology, Havel and Company are challenging politics *itself* (the organisation of power by human beings over each other) as altogether inappropriate for and detrimental to human society.

In his famous and seminal essay written in 1977, 'The Power of the Powerless," Havel clearly states the essence of his "anti-political" philosophy. The power of the "powerless" in any society (including the totalitarian or "post-totalitarian" states of Eastern Europe) lies in the refusal to "play the game," the refusal to compete for power. The power every individual has to live one's own life *as if a* free man in a free society. In the living of such a life, one becomes a free man, as Havel was a free man even during his years in prison, even now as President, even as those who imprisoned him were not: they were trapped as we now see so clearly, by their commitment not just to a political ideology, but to the very notion of retaining power.

There has been much discussion in the recent past of the possibility of a "third way" (as an alternative to the tired dichotomy of capitalism vs. socialism) emerging in Europe. Some saw it in "Socialism with a Human Face," the Czechoslovak experiment of 1967-68; others saw it in the prospect of a "convergence" of the two systems, each adopting the best aspects of its opposite to correct its *own* failings. Today, many believe that the "collapse of communism" signals the victory of capitalism. These people (economists, in particular) tell us there is no "third way."

Neanwhile, back in Czechoslovakia, in the very heart of Europe, Vaclav Havel finds himself President. Talk about a "third way" has ended (there is no time for it *now)*, but it *is* being lived. Simply, profoundly, humanly. By living "as if" there is a third way, the Czechoslovaks are creating it.
Anita Shelton
The Accorn
A Gandhi an Review Vol. 5 No. 1 March 1990.

Indigenous Uprising in Ecuador

On 28 May, 1990 about two hundred tribals occupied the church of Santo Domingo in Ecuador's capital Quito. They presented the government a petition of 16 points concerning the rights of the indigenous population of that South American country. The government, however, reacted by sending in the police to surround the church in order to solve the 'crisis'.

The opposite happened: On the evening of 3rd June, tribals in the mountainous Andes region and the jungle areas of Amazonica blocked roads, occupied squares and declared an 'indigenous uprising' (levantamiento indigena) between June 4 and 6. With this expression they placed their action into the tradition of the big indigenous revolts of the eighteenth and the nineteenth centuries. The government was forced to negotiate.

Forty-five percent of Ecuador's population belong to nine indigenous communities which have partly managed to preserve their traditions and social structures. The 1980s saw a revival of the indigenous movements and rapidly the indigenous population became the most highly organized sector of the society.

At the same time, the slow down of agrarian reform, no development of the educational and health situation in rural areas, a total of 72 land disputes with indigenous communities, and the growing encroachment by colonizers and industry (oil, resource exploitation) on indigenous lands in Amazonica have created awareness among the indigenous people. In tact, today only ten percent of the cultivable land actually belongs to the tribals. The main demands of the uprising were: a solution to the land disputes, granting of land rights to the communinities and the transformation of the state into a 'pluri-national' system. The demand to recognise the indigenous medical practices, among others, demonstrates the growing cultural self-awareness of the tribal population.

In 1492, Columbus 'discovered' America. European colonizers benefited from this discovery. The uprising marks the beginning of the commemoration by the tribals of five hundred years of foreign domination. It is remarkable that tribal organisations have demonstrated their political maturity by remaining completely non-violent, by not allowing political parties to use the events for their own ends and by developing concepts for a total transformation of society.
Source: SERPAJ-AL, Guayaquil;
Hoy Daily, June 5—10,1990

Perestroika in Practice

An unprecedented confrontation between the public and the Navy took place in the Soviet Far East after a local newspaper" *Voskhoo"* wrote that the military had decided to use a harbour close to the city of Sovetskaya Gavan and the village of Vanino as a "chopping block" for decommissioned nuclear submarines attached to the Pacific fleet.

There was immediate explosion of public indignation. The official reaction too, was quick. At a hastily convened meeting of the Vanino District Communist Party committee, Anatoly Klimov, the first secretary reprimanded the editorial board of the newspaper for what he termed its "inventions". At an emergency meeting of the presidium of Sovetskaya Gavan's Soviet of People's Deputies, Yuri Savkin, member of the naval garrisons political section, shared Klimov's sentiments and tried to placate people's fears. "We haven't received any order to dismantle the subs' heat-emitting elements (nukespeak for nuclear fuel)."

But in contrast to the political instructor, the naval specialists did not try to lie and spoke frankly. "We have orders from the fleet commander to unload nuclear fuel from the reactors. The planned schedule for the dismantling is ready. The work, though it will inevitably increase radiation is in principle, safe."

The deputies however, did not share in this official optimism. Physicians cited the district's already greatly increased cancer rate, especially among children, and one angry housewife, speaking on behalf of other mothers, demanded that the Navy remove all its nuclear subs, and that the Tatar Strait be turned into a nuclear-free zone.

A non-sanctioned meeting was held in Vanino on May 18, 1990. It was the first of a whole series.

The speakers are quoted In local newspapers as having said: "We are tired of living in fear" and "How can we believe the specialists after their many years of covering up about Chernobyl."

In the beginning of June, Mikhail Gorbachev, said in a TV interview in USA that " We have amassed so many weapons that we don't know how to get rid of them."

Over 40 percent of all Soviet nuclear submarines have been in service for more than 20 years and will have to be retired on a mass scale. But nobody in the world knows what to do with nuclear subs, how to disassemble their reactors and where to bury them. (Why what's the problem? Lease them to India, the land of Buddha and Gandhi -Editor). In short, by removing the threat of nuclear war, we have become captives of another threat — global pollution in the form of nuclear waste. It was not inexpensive for us to arm but, judging by everything, it will be even more costly to disarm.

In the meanwhile, the energetic protests of the coast's hundred thousand population forced Vladimir Kuroyedov, chief of Sovetskaya Gavan's naval garrison to stop, at his own risk, the operation ordered by the commander of the fleet. He even allowed public representatives to watch over the subs where the work had been planned. A specially elected strike committee called off its planned general strike this June and so defused an explosive situation. Resolutions of meetings were sent to fleet HQ telling them that they had until July 1 to announce when they would be removing the subs from Sovetskaya Gavan.
Stanislav Glukhov
Moscow News June 24—July 1, 1990.

The American Dream—2

Over the past year massive experiments in nonviolent resistance have erupted in two rural counties in upstate New York. The people have mobilized to protect their communities from the threat of nuclear waste. Both Cortland County in Central New York and Allegany County in the southwest corner of the state are plastered with antinuclear posters, signs and billboards. Thousands of citizens have entered the activist world, many for the first time in their lives. They have written letters, put orange "No Nuclear Dumping" posters in the windows of their homes and cars, demonstrated, and physically blocked state officials from inspecting the proposed sites. The level of excitement and anger has been tremendous as these newly awakened activists have begun to recognize their power and responsibility.

In 1988 Governor Cuomo appointed the Low Level Waste Siting Commission to locate a site for a dump and decide upon the disposal method. The Commission soon settled down on a 'short list' of five specific sites, two in Cortland County and three in Allegany County. Nobody has believed the Commission's claim that they can build a dump that would pose no threat to the host community.

The selection process is currently at an impasse. Massive non- violent resistance has stymied the Commission's efforts to inspect the sites and move forward with the selection process. In their six attempts to perform on-site work, they have been prevented from getting near the sites four times and twice they have been surrounded and stopped after reaching the sites. The Commission has publicly admitted that they are unable to carry out their task and have sought to increase legal penalties for obstruction.

Ultimately the value of the movement will be decided by its long term impact. Will people see and understand the connections between environmental destruction, social oppression and an economic system based on profit? And will these people retain their commitment or will they go back into their pursuit of the American Dream?
Andy Mager and Kath Buffington
NONVIOLENT ACTIVIST Vol.7 No.5
July/August 1990

lulling One's Own

The atom bomb which was dropped on Nagasaki killed many thousands of Japanese. But it along with other nuclear weapons used for tests during the "cold war" also killed and continues to kill many Americans too. We have previously carried a number of reports in *Anumukti* (see Vol.3 Nos 2, 3 and 4) regarding the health consequences of the radioactive iodine releases at the Hanford facility belonging to the U.S. Department of Energy. These reports have included first person accounts of the suffering caused to those who were children during the years 1945-56, as well as a review of a book which dealt with just this problem. On July 11th, 1990 the U.S. Department of Energy admitted publicly for the first time that the doses were high enough to have caused illness including cancer in nearby residents. This belated government admission presumably opens the way towards compensation of the victims through lawsuits and legislation.

The Unending Nightmare

British experts and equipment are being sent to Gomel in the Soviet Union as part of an international effort to assess whether another three million people need to be evacuated as a result of the Chernobyl accident four years ago.

The Russian authorities finally agreed to allow access to all the information available about Chernobyl after fears that up to one million children may be suffering severe health effects. The fallout of Chernobyl is now estimated to be 50 times greater than that of the Hiroshima atom bomb.

Five scientists from the International Atomic Energy Agency (IAEA) have been to the Soviet Union to establish what needs to be done to find out the full effects of the disaster.

The most serious problem is that more than three million people live in contaminated areas and have ingested radioactive material but no one yet knows what effect this is having on them. The Soviet Union has little of the specialised equipment required. Boris Goudima, foreign affairs for the Ukraine told the *Guardian:* "We are still only realising the true extent of the tragedy. At first the Russian authorities did not tell us in the republic what was happening and we could not find out the extent of it because we had no equipment to measure it. Now we can see it for ourselves. All the children in the contaminated areas have swollen thyroids. They do not laugh or run or play like children, they sit around in groups like old men."

In the Ukraine five million hectares of farmland and 1.5 million hectares of forest are contaminated. Despite some 90,000 being evacuated, there are still some 1,600 towns and villages occupied in this area, with a population of 1.5 million. This year another 15,000 people will be resettled but another 150,000 with seriously affected thyroid glands need to be removed. Radioactive hot spots are still being found.

The neighbouring republic of Byelorussia has 20% of its farmland and two million of its population contaminated. Mr.A.N.Sytsjev, a foreign minister, said: "The consequences of the Chernobyl disaster have turned out to be much larger and on a more serious scale than was perceived by many, including prominent scientists and experts."

So far only 173,000 people, including 37,000 children, have had extensive health checks. A further two million need them. Britain is being asked to supply individual dose meters and other equipment as well as medical and nuclear scientists. Hans Meyer, spokesman for the IAEA in Vienna, said: "The Soviet authorities have at last agreed to put all their cards on the table. We shall be establishing the headquarters at Gomel between the two most damaged areas in the two republics to make the first proper assessment of the real scale of the damage, It is a daunting task."

Women in the contaminated areas have no access to uncontaminated baby foods because of lack of relief funds.

Mr Meyer said that the IAEA had to assess the scale of the problem and then make recommendations. Its report is expected to be ready by the autumn.
Paul Brown
The Guardian May 21,1990

While going through the account of your cycle yatra I had a strange feeling which I would call healthy jealousy. Every day there are several reminders of the prison that I have created around myself but the cycle yatra also reminded me of the possibilities of fulfilling childhood dreams of adventures with a much greater meaning! I don't know exactly when, but some day I am bound to join you people in your yatra.

Sanghamitra's report on the health of people around Rawatbhata reactors is so shocking that one feels at a loss for words. I have got it xeroxed and given it to some people here. I am also going to send it to all the newspapers.

During the last few months I have been trying to gather more information on the Narmada project. It is very distressing to realise that the Gujarati press refuses to see the problem of rehabilitation .as it really is, Even if we accept that the 19 villages of Gujarat can be rehabilitated, it is no more than a small fraction of the task. I find the stand taken by the Vahini group at Mangrol also very disappointing. They are perhaps doing a very good job of monitoring the rehabilitation of villages in Gujarat but they say nothing openly of the just demand of the 6 villages of Kevadia and other project affected people. It is said that they have serious differences with the activists in M.P. and Maharashtra, but is it not clear that none of the state governments have so far identified the land required? And what if even after the land is identified, the villagers refuse to move? One hopes that as time passes the real nature of the project will become clearer to those who believe it is inevitable and that there will be a united front of all activists who will support the villagers who will be refusing to move.

I have recently come in contact with a group of young students who call themselves "Nature Crusaders" and they have shown great interest in the environmental aspects of the Sardar Sarovar Project. One of them, Chandrakant Patel, has done a survey of the waterlogged lands in Kheda district. During our next meeting I intend to suggest that we start a group to discuss issues related to nuclear energy.
Kersi Sabavala
Sigma Equipments
886/2 GIDC, Makarpura
Baroda 390010

Since the defeat of Dr. Karanth in the last elep-tion, CANE (Citizens Against Nuclear Energy) and the rest of the antinuclear movement in Karnataka seemed to have gone into a coma. But recently there have been some attempts to revive the movement. Now there is one immediate issue about which concerted efforts are required. The petition filed by Dr. Karanth and others on Kaiga has come up in the Supreme Court for hearing. We have formed a support group in Bangalore to back up the efforts of the legal team in Delhi. Unfortunately, the lawyers handling the case in Delhi are not knowledgeable about nuclear power in general and Kaiga in particular. V.M.Tarkunde is to present our case in the Supreme Court and has to be thoroughly briefed on the subject. On July 9th, when the court reopened after the summer vacation, it served a notice on AEC, NPC, et.al. to submit their arguments in two to three weeks. After which the case is scheduled for actual arguments on August 28.

We are trying to send as much information and documents to our lawyers in Delhi. In that connection, it would be useful to have detailed reports of radiation effects around Rawatbhata. From a legal point of view radiation effects infringe upon the right to life. So please send as much data as possible in whatever form it exists. Some photographs have been published in *Anumukti.* Congratulations! They might be useful in court.

The April issue of *Anumukti had* a write-up on the fifth BEIR report. There were also references to other reports which implied that the effects of low-level radiation have been grossly underestimated in the past. These too would be useful.

We have been told that social, ethical and financial arguments are not decisive in a court case like this, but respectable and authenticated studies and arguments based on the law have to be invoked. We will put in our efforts and hope for the best.
San jay Havanoor
61, Central Excise Layout,
Vijaynagar, Bangalore

I am sending a copy of a news item which appeared in *Moscow News.{See* Page13-Editor). *Financial Times* has recently published a gist of a report by U.K.Energy Commission which criticises the Department of Energy in that country. The same paper also carries a report on the problems of the power plant manufacturing industry in Czechoslovakia. I think both these reports will be of interest to *Anumukti* readers.

The Bengali version of *Nuclear Free Seas* by Greenpeace is out. This book is dedicated to Narayan Desai, Shyamali Khastagir and Dr.Shivaram Karanth. (All dedicated antinuclear activists -Editor) The introduction is written by the International Campaign Coordinator of Greenpeace. I do not know how much money I will get as royalty from the book. But whatever it is, the royalty will go to *Anumukti.*
Niranjan Haldar
79, R.K.Ghoshal Rd., Calcutta 700042

I am simply feeling sick going through Sanghamitra's report on Rawatbhata in your June/July issue. How long would our scientific community and so called intelligentsia remain spectators? I salute the *Anumukti* team for keeping the feeble flame of protest still burning.

At present I am trying to write a small book along with Dr Subhendu Dasgupta and one of our friends on India's growing military-industrial complex. We plan to write it in Bengali so as to reach a wider section of people.
Dipankar Dey
28, A.V.L. Street, Calcutta

Two days ago, we had a CANE meeting, mainly to discuss how to counter the Nuclear Power Corporation's 1 /4 page ads that have started appearing in the press. We shall be meeting shortly again, to finalize the drafts and later I will post it around the country.

However, the main reason for this letter is, can you send me a xerox copy of the letter sent to N.P.C. by Sigma Equipments which appeared in your last issue. What I am visualising is to circulate this letter to members of the Chamber of Commerce in Karwar, Hubli, Dharwad and in Goa.
Hemachandra Bassappa
21, Railway Parallel Rd. Nehru Nagar
Bangalore 560020

The June/July newsletter is an improved issuel Its contents, as dramatic as they are easy for lay readers, should do some great service.

Can I copy from *Anumukti* and send the text as letters to the editor with reference to the newsletter? Do you send Anumukti to institutions and ministries in India? To schools, universities and technical centres?
S.Sharma-Hablik
32 Rue Suffren
Pondicherry 605001

Any material which appears in *Anumukti* can be copied with or without reference. One of the purposes of *Anumukti* is to give wide coverage to the information contained in it and we would be only too happy if our readers were to perform this service. We send one complimentary issue to anyone whose name is suggested by any reader. Due to financial constraints and also on ideological grounds we do not give *Anumukti* gratis on a regular basis.

The following is the copy of a letter written to Shri V.P.Singh, the Prime Minister of India.

The 1989-90 annual report of the Department of Atomic Energy (DAE) has a map of India showing the location of all DAE installation and facilities. This map, however, makes no reference to DAE's massive installation — Rare Earths Material Plant at Ratnahalli, near Mysore. Several times in the past, the residents of Ratnahalli and Mysore have alleged and protested that this is a secret installation to produce enriched uranium towards a weapon's programme. Are their' fears and suspicion justified?

Secondly, the omission of reference to this installation raises several serious questions with dangerous implications in view of the Treaty with Pakistan on the Prohibition of Attack Against Nuclear installations and Facilities. Article II of this treaty states:
"Each contracting party shall inform the other on 1st of January of each calender year of the latitude and longitude of its nuclear installations and facilities and whenever there is any change."

Will you please kindly explain to the people of India as to what is going on at Ratnahalli. The people of India have not given you or anyone else the mandate to make a nuclear weapon. In a recent interview you are quoted as having said that in the future you shall deal firmly with situations. May we plead with you to enforce this firmness with the Department of Atomic Energy and the Nuclear Power Corporation and get someone to brief you on their facilities.
Hemachandra Basappa
21 Railway Parallel Rd., Nehru Nagar
Bangalore 560020

Anumukti strongly condemns the testing of a new missile named "Akash" by the India.

We believe that research and production of new weapon systems do not help to reduce tension and the possibility of war in South Asia. Investment into war industries goes hand in hand with reduced efforts in the social and economic sphere and are thus bound to sharpen social conflicts within the country.

Keeping these points in view we suggest the following action: Please write letters to Dr. Raja Ramanna, Minister of State for Defense, asking him to reconsider the whole missile programme and to divert the weapons research budget to socially useful (that excludes nuclear energy) civilian research. Please send copies of the letter to Shri V.P.Singh and to your local news media. We would appreciate if you could keep us informed about any reactions and send us newspaper clippings.

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 2 *October/November 1990*

> *"People have to operate* nuclear power *plants no* matter *how much automation we introduce. People are forgetful, often they are* irresponsible and quite a *few of them suffer from deep-seated* irrational tendencies *towards hostility and* violence. I believe *that the confident advocates of the safety of* nuclear power plants base their *confidence too* narrowly on *the safety that is possible to achieve under the* most *favourable* circumstances, *over a limited period of time, with a corps of* highly trained and *dedicated* personnel"
>
> J.T. *Edsall*

When anything seriously untoward happens in the nuclear system anywhere in the world, the first reaction of nucleocrates elsewhere is, "IT CANT HAPPEN HERE!" After Chernobyl disaster in 1986, this litany was heard all around the world, may be even in other parts of USSR itself! It would not be an overstatement to say that at least for the Indian nuclear establishment frequent repetition of this mantra has been its only response to Chernobyl. Even almost four years after the event, Dr. M.R. Srinivasan, the then Chairman of the Atomic Energy Commission, wrote :

> *"After the* Chrenobyi affair, *the question has often* been *raised about whether or not* a similar *accident could happen in the* Indian nuclear power *plants. My* answer *is again 'no'...* The *accident at* Chernobyl *took place* mainly *because of the total disregard shown by the reactor operators for safety* rules and procedures, and'the inherent *design deficiencies."*

One of the presumptions underlying this preposterous assertion is a feeling that 'our' operators are some how better than 'their' operators. Mr. M.R. Srinivasan has often in the past said so in so many words. "Operators in India, unlike their counterparts in the West, are graduate engineers who are well trained in all aspects of reactor operation and can analyse any problems that may arise during the running of the reactors." The establishment has assiduously tried to create an impression, that unlike the drug-taking, high-school pass, order disobeying nit-wits who man reactors elsewhere, the Indian 'scientists' who control our reactors are a dependable lot, who pay meticulous attention to safety and security procedures and can be relied upon in all circumstances. May be, by and large, this does describe the true state of affairs correctly. I just don't know for sure because the secrecy which surrounds these operations does not allow any outsider to come to any sensible judgement. But the crucial point is that nuclear energy is an unforgiving technology, which does not allow any by and larges. It demands absolute reliability from all. Designs, materials and personnel must all be, without exception, flawless. Therefore, the newsreport [See Box, Page 2) of an attempt by an employee to sabotage .some pressure gauges in unit-2 of Rajasthan Atomic Power Plant (RAPP) at Rawatbhata causes special alarm. The incident shows that despite all screeings and security checks it is possible for a petty minded self-server to have access to vital parts of the reactor and place in jeopardy the life of millions.

A reactor operator deliberately blew-up a military reactor in the US in 1961. The enquiry commission which investigated the incident found him to be emotionally disturbed due to lack of promotion and marital problems. But this finding was of little use to his two colleagues who died with him or to the 720 people who were contaminated in cleaning up the mess he left behind.

The most alarming aspect of the RAPP 'unusual incident' is the flaccid way it has been handled by the authorities. Unfortunately this lackadaisical attitude to safety is far too usual.

The Chief Superintendent of the Rajasthan Atomic Power Plant, G.R. Srinivasan has admitted that an attempt was made to sabotage the turbines attached to the plant but claimed that it posed no great danger to the surrounding community. A team from the Central Bureau of Investigation has conducted an enquiry into Ine incident.

On 16th August, 1900 both the units at RAPP were under shut down for their annual maintainance. At 12.10 PM, a technical employee Mr. B.K. Jacob put a large bundle of cotton waste into the lubricating oil pipline of one of the turbines of unit-2 causing an obstruction. An engineer and another employee of the plant saw Mr. Jacob doing this and he was caught by them in a very dramatic, fashion. Soon alter senior authorities were informed of the incident

Under questioning Mr. Jacob admitted his fault and said that he had done it out of frustration at not getting promotion. He felt that due to the obstruction the unit could not have been started, and later he intended to 'discover' the obstruction and thus prove his capability for promotion!

Mr. Srinivasan said that there was no grave danger to the turbine due to this obstruction but it might have taken a few days to locate the particular pipe and that would have caused a severe production and monetary loss.

Desh Ki Dharati October 29, 1990 and Rajasthan Patrika November 2, 1990 (translated from Hindi)

Attention Koodankulam : VVER Reactors Found Unstable

According to an internal report from the Czechoslovakian Atomic Energy Agency (CSKAE), experience of the VVER 1000 reactors which are presently in operation in USSR and Bulgaria "confirms that operation is difficult to control" and the reactors are for that reason "extremely unstable." Among other things the automatic controls are "insufficient." The primary cause of the instability, said the report, is the use of two year fuel cycles which prevents use of burnable absorbers in the fuel. The resultant excess reactivity (in the core) is compensated by a higher boric acid concentration. This, however, "leads in some loading schemes to extremely undesirable positive values for the temperature reactivity coefficients."

Jargon Explanation

Each time a uranium 235 atom breaks it produces two large pieces (known as fission fragments) and sometimes two and sometimes three neutrons. These neutrons collide with other uranium 235 atoms and induce them to break. For a stable chain reaction as in a reactor one needs that one and only one of these neutrons on the average causes fission of an other atom. The key phrase here is : on the average. Since neutrons from any particular fission may of course get 'lost' — get absorbed by the fission fragments or water or tubing, reactor building, etc. Or else all the neutrons from a particular fission may cause other atoms to break. As the reaction proceeds, the conditions within the reactor core are continuously changing — the number of uranium 235 atoms are decreasing while the numbers of the fission fragments are increasing. Hence the neutron number control mechanisms need to be adjusted continually. Boron is a good absorber of neutrons. So since one wants the reaction to continue for two years without pause for reloading what is done is that at the beginning one keeps the number of uranium 235 atoms somewhat more than need be and also have a larger concentration of boron. As the reaction works itself through, the uranium 235 number will naturally decrease,and one can reduce the concentration of boron gradually thus keeping the overall neutron economy in good order. What the Czechoslovak's are saying is that in practice this procedure is not easy to control. For particular geometries of loading it may so happen that a lot of the concentrated uranium 235 may get together and as the reaction proceeds apace and accelerates and the temperature rises there may be a power surge like the one that rocked Chernobyl.

Officials at Gesellschaft fuer Reaktorsicherheit mbH, where experts from Czechoslovakia, the German Democratic Republic and the USSR are investigating VVER reactor safety, confirmed that the two year fuel cycles have been causing problems for other Eastern European and Russian reactor operators as well. According to one official, information available thus far shows that the reactor safety relevance of the WER 1000 core design problem is "not trivial" and that "axial fluctuations can occur in the core with high amplitudes and these are difficult to get under control." Local core temperatures, he said, can increases beyond allowed limits and boiling of fuel assemblies is possible. Besides the VVER 1000s presently in operation in the USSR, there are two in operation in Bulgaria and four under construction at Temelin in Czechoslovakia. The Czechoslovakian government, however, is considering cancelling the second two units and replacing them with reactors of Western design.

Source : WISE *News Communique* 337, 31 Aug., 1990

The Sterilized Zone

We hove *recently acquired a copy of Nuclear Off-Site Emergency* Response Plans *prepared* in the wake *of* the Chernobyl *disaster* in the Soviet Union in 1986. These plans have been *prepared by* the *State Level Emergency* Response Committee, *in consultation with* nuclear plant *authorities, National Level Emergency Response* Committee, *Atomic Energy* Regulatory *Board, Nuclear Power Corporation and Bhabha Atomic* Research Centre. The *plans have* been *issued in 1988, have not* been subjected to *any revision and thus represent the latest official* thinking on *this issue. Despite repeated* requests *for a copy (a* matter *of vital* concern to us, since *we live* uncomfortably close to a nuclear plant] the authorities *have not* seen *it fit to provide us with* one. *They have not denied us* our *rigjht to have it but have just gone an procrastinating for the last two years. We will be* presenting relevant portions *of the plan along with our comments under this* heading in *the next few issues. The* present article *deals with the assumptions that underlie* the whole planning process whereas the *future articles will deal with the specific protective* measures to be undertaken.

Planning Basis and Concepts

The following principlos shall form the basis of all nuclear offsite emergency planning and management :

The State through its designated agencies, has primary responsibility for the health, safety and welfare of all inhabitants of the state and the protection of property in normal basis as well as emergencies such as floods, droughts and fire and so on. Such emergencies also include nuclear offsite emergency for which this plan is made.

> If nuclear emergencies are emergencies on the same footing as are floods, droughts and fire then why does Life Insurance Corporation and other insurance agencies not insure the public against nuclear disasters as they do in the case of floods and fire. In fact there is a specific clause in insurance policies absolving the agencies of all claims arising from a nuclear emergency.

Even though nuclear power plants and other nuclear facilities are designed and operated according to stringent safety standards and those in India have an excellent safety record, emergency planning must operate on the basis that mechanical failure and/or human error can lead to accidents of a magnitude resulting in unacceptable off-site consequences.

> The 'excellent safety record' is unfortunately unknown to the public since the performance records of various nuclear facilities are classified information. It is only when an independent agency is able to analyse the records of all 'unusual incidents', forced scrams, leaks, spills, 'lost radioactive sources, etc. that one would be able to form a fair judgement as to whether Indian safety record is excellent, mediocre, poor or flunk..

The more severe a postualted accident the less likely is its occurence. An appropriate balance should be struck between risk and cost when assessing the level of emergency planning and preparedness required.

> This principle is in effect saying that prepare only for small accidents, since large accidents are extremely unlikely. The neat inverse relationship between the probability of an accident and its severity applies only to "postulated' accidents. These are those accidents which have been foreseen by the designers, and then adequate safeguards have been taken to combat them. Unfortunately in the real world, the accidents that do take place are the ones not foreseen. One reason for this is the unpredictable 'human factor.'
>
> Furthermore, the risk/benefit assessment methodology employed in this principle makes no sense. A better principle would be to have emergency planning and preparedness based on "worst case' scenario, irrespective of cost effectiveness. Certainly these high costs will be insignificant in relation to the lives and properly that could be saved in the event of a real accident.

Exposure to radiation shall be kept as low as reasonable achievable.

> The key word here is 'reasonable.' An effort to reduce radiation exposure that might seem reasonable to a nucleocrat safety ensconsed in an office in Bombay may seem totally inadequate to a person living near a nuclear plant who is being exposed to radiation. So who decides what is reasonable!

As much planning and preparation as is practical shall be done in advance to unable a rapid, effective and efficient response to a nuclear emergency.

> Again the key word here is 'practical' It seems to suggest that emergency plans should not be over emphasized since 'everyone will do what is necessary' in the event of an accident. Emergency plans ought to be more than mere 'guideposts' to effective action. They should be well known, well understood, and well practiced steps to emergency action. For example, when confronted with the criticism that the size of the emergency planning zones is too small, government officials all over the world usually respond that these zones can easily be enlarged if authorities at the time of the accident deem it necessary. Yet, this assumption fails to recognize the logistical and practical implications of such a decision since detailed planning in a non-zone areas is non-existent. The purpose of the emergency preparedness plan should not be to give the public a

false sense of security.

Preparations shall include a cost-effective programme of public education for people who might be affected, to inform them of the plans and to help them cope with a nuclear emergency.

The programme of public education has been so cost-effective that it has incurred no costs at all. The public has no choice but to get educated on its own initiative if it is interested in its survival. For example, as I mentioned in the beginning, I have been asking the Kakrapar authorities for the last two years to give me a copy of this plan and they are yet to do so.

A policy of truth and openness shall be followed in providing information to the public and media during a nuclear emergency to discourage rumours and misunderstanding.

NO COMMENTS!

Types of Accidents

An accident in a nuclear reactor cannot result in a nuclear explosion. A typical nuclear accident that could cause a nuclear emergency - its probability being one in 10,000 reactor-years - is a Loss of Coolant Accident (LOCA).

This impressive figure of one in ten thousand reactor years has come out of a hat : Dr. Rasmussen's hat. Till 1975, nucleocrats used to claim that the chances of a core-melt were one in a million reactor-years. He devised a method of assessing accident risks of a nuclear power plant and came with the one in ten thousand figure for a core-melt and a one in million reactor years figure for an accident with wide dispersal of radioactivity. There are two problems with this comforting figure. Firstly, these risk analyses are plant - specific and there has been no claim from Indian nucleocrats that they have conducted these analyses an Indian reactors. Secondly and more importantly, reactors have not been obeying the dictates of risk analysis and have been having accidents far more frequently. Thus, the core-melt at Three Mile island took place after only 1,300 reactor years of operation while the Chernobyl disaster instead of waiting a decent fraction of million reactor years took place after only 1,800 reactor years.

Nuclear reactor containment is a system of massive concrete and steel barriers with a limited number of designed openings that are closely controlled and monitored. Although simultaneous failure of the containment system and a loss of coolant accident are highly unlikely, nuclear emergency planning is carried out to cope with even such unlikely dual failures in reactor safety systems to minimize public risk.

Reactor containments for all their concrete and steel, are not built to withstand all kinds of overpressures that can build up within. In case of a failure of the emergency core cooling system, there are good chances that the containment too shall fail. In fact a study in USA on Tarapur type Boiling Water Reactors found that the chances of containment failure were nine out of ten.

The serious nuclear accident for which detailed planning and preparation shall be done is one producing an effective whole body dose of 10 rem at a distance of 1.6 km from the nuclear reactor.

Radiation Hazards

Nuclear accidents could result in two types of emissions :

(a) An airborne emission, involving the release of radioactive material into the atmosphere.

(b) A liquid emission, such as the release of radioactive liquid into a river, lake or water course.

These emissions can effect the human body or animals externally or internally in the following manner :

(a) External exposure to airborne or waterborne radioactive material, or to deposits on the body, clothing, ground, building and other objects.

(b) Internal exposure due to irradiation from inhalation of radioactive material or the ingestion or radioactive material through the consumption of contaminated food and water.

In managing a nucler emergency the radiation hazards to be considered are :

(a) Initially, the main short term danger would be external irradiation from the radioactive plume. Lesser hazards would be inhalation of radioactive material, especially radioiodine (which would accumulate in the thyroid gland), or the radioactive material deposited on the body, ground and food.

(b) After the release has ended, the long term hazard would be from consumption of contaminated foods, espcially milk and water. Lesser hazards would exist from deposited or resuspended radioactive material.

The levels of radioactivity that are expected to occur offiste in a nuclear emergency are extremely unlikely to expose people to the risk of radiation sickness or other acute effects. The main risk that emergency plans seek to avoid is an increase in the long term incidence of cancer among the population*

Also hypothyroidism, loss of fertility, genetic disorders, allergies, asthama, spontaneous abortions, lowering of the immune system .... etc.

Protective Measures

The body can be protected from external irradiation by preventing or minimising its exposure to the radiation source, by distance, by limiting the time of exposure or by shielding.

Complete protection from internal irradiation can be obtained by preventing ingestion or inhalation of radioactive material. Once radioactive material enters the body, radiation exposure diminishes with its decay, and ends when the material is completely eliminated from the body.

In other words, don't breathe or eat. If radiocative materials do get into the body, there is no way to reduce exposure and all one can do is to wait the natural bodily processes expell the substance.

A special method of protection is available for the thyroid gland which absorbs and stores iodine. If there is a risk of radioiodine entorting the body, the thyroid's capacity to a absorb it can be reduced or eliminated by taking stable iodine before or even shortly after the radio-iodine enters the body. This is known as thyroid blocking.

The specific protective measures available for dealing with the radiation hazard in a nuclear emergency are :

(a) Sheltering
(b) Thyroid Blocking
(c) Entry Control
(d) Evacuation
(e) Decontamination
(f) Use of Protective Equipment
(g) Food Chain Protection
(h) Food and Water Control

Emergency Zones and Sectors

The area around a nuclear facility for which a nuclear emergency plan is made shall be divided into the following zones :

Contigneous Zone : 1.6 km radius from the nuclear facility.

This is the zone immediately surrounding a nuclear facility. An increased level of emergency planning and preparedness may be advisable within this area compared with the rest of the Primary Zone because of its proximity to the potential hazard. This is also called Exclusion Zone as residential habitation within this area is prohibited. This area is fenced and is under the full control and responsibility of plant management. Outside this fence of 1.6 km radius, the responsibility for the nuclear offsite emergency response rests fully with public authorities.

Increased planning and preparedness for an area in which nobody lives!

Sterilized Zone : Between 1.6 km and 5 km radius from the nuclear facility.

In this zone new growth of population development acitivity is prohibited by law {to be enacted) so as to restrict the population to easily transportable number in case of nuclear emergency. This zone is included in the Primary Zone. Area under consideration may be put under "Contonnment Board" or similar authority (proposed).

How is the prohibition on population development activity* to be enforced? By compulsory sterilisation! Parts of Mandvi (population : 25000) fall within 5 km of Kakrapar nuclear power plant, and there would be many such examples from other plant sites.

Primary Zone : Between 1.6 km. and 8 km from the nuclear facility.

In this zone it would be prudent to plan and prepare measures such as sheltering against plume exposure. Evacuation may also be required. Responsibility beyond 1.6 km is fully with state public authorities.

Secondary Zone : Between 1.6 km and 16 km radius from the nuclear facility.

This is a larger zone within which it would be produent to plan and prepare measures against exposure from ingestion of radioactivity. The Secondary Zone includes the Primary Zone. The distances will be taken from the reactor building/nuclear facility.

For the sake of comparisioa in USA the primary zone extends 16 kms and the secondary zone extends 80 kms from the reaction site. Even this is grossly inadequate as can be seen from Chernobyl. There, people within 30 km radius had to be immediately evacuated (primary zone); whereas food restrictions need to be imposed in hot spots' as far away as 400 km from the plant site.

See also the book review of Emergency Planning in Case of Nuclear Accident in this issue.

We *will discuss these special protective* measures in greater *detail in future issues.*

The mysterious Case of the Vanishing Subscriber

Yes, it is a great mystery to all of us. Has the nuclear establishment called it quits and gone to meditate in the Himalayas? Or does the coming of the new government herald a new nuclear free dawn? Or perhaps, God forbid, Anumukti has become boring, silly and full of misinformation! How come the subscribers list has shrunk almost to vanishing point!
Don't let Anumukti die a gruesome death, drowning in a pool of red ink! Send your subscription to our office (for the address, see the last page) today.

AN UNPRECEDENTED TRAGEDY

For the first time an official document — a decree of the USSR Supreme Soviet adopted on the eve of the fourth anniversary of the Chernobyle disaster — described it as the biggest calamity of the century, and a tragedy of the entire people affecting the fate of millions.

> *"Chernobyl was no doubt by far the worst accident that has taken place in the nuclear industry in the world. A Total of 28 deaths took place which is equivalent to two days loll of road accidents in Maharashtra only."*
> *Dr. A.K.De* - the *then chairman of Atomic Energy Regulatory Board.*

"Chernobyl was no doubt by far the worst accident that has taken place in the nuclear industry in the world. A Total of 28 deaths took place which is equivalent to two days loll of road accidents in Maharashtra only."
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The crudest violations of technical procedure in operating the reactor plus its shortcomings and the unreliability of the equipment and control instruments have resulted in a hitherto unheard of tragody in the history of humanity. Deputy Yulia Drunina called it the apocalypse of our century and sharply condemned those who *"had in that* hour of *trial seated their* children into big office *limousines, while those of the non-nomenklatura* had been lined up *in the May Day holiday* columns and *led to city* squares to celebrate under *the clouds of radioactive dust."*

Blame for the inadequate measures taken at the time of the disaster and later, lies with the Ministry of Atomic Energy, the Ministry of Health and the State Committee for Hydromoterorology. These minitries concealed all information regarding the real state of affairs.

People's deputies asked many awkward questions in their speeches. Why is it that even today, information about the state of the health of the children continues to be kept secret ? Who is personally responsible for making the people stay in the contaminated zones ? On whose orders has the USSR Ministry of Health been turned into the Ministry for Opportunistic Propaganda ? And so forth.....

The position of the USSR Council of Ministers was : "Why delve into the past, when there are urgent problems of today and tomorrow facing us?"

New evidence collected by the Byelorussian Acadmy of Sciencies indicates that the medical effects of Chernobyl disaster are much greater than has been generally predicted.
The blood of pregnant women in Gomel, was found to have nine times as many severely abnormal ("dicentric") cells as that from women in a control area, Kalinin. Moreover, the frequency of multiple chromosome abnormalities is increasing. In Byelorussia as a whole the incidence of all recorded congential abnormalities since the accident has increased by 70% *and that of major specified abnormalities by 50%. In Mogilyov, the development of nine year olds has been retarded on the average by about three years. In this area* 20% *of the children received a doze of 1,000 rads to the thyroid. Beylorussia has a population of over ten million. There has bean an increase in cancer registration of between a third and a quarter. Specifically, the number of thyroid cancers is increasing, and in Mogilyov region there has been a rise in luikaemia registrations from 22 in 1985 to 40 in 1988. There is also evidence from animal studies of a severe depression of the immune system.*
The Lancet ; *May 5, 1990*

"Thousands of people have become hostages of the disaster caused by 'Atoms for Peace'," said Deputy Igor Luchenok. Among them are those growing produce on contaminated land and those consuming it. And each one of us can potentially find ourselves in the latter, for contaminated fruit and vegetables, meat and milk, poultry and cereals, sunflower and flax are spreading all around to other parts of the country and the world, not without the participation of government bodies.

Some deputies with great urgency pointed out that if we repeated the mistakos of the past four years and did not take cardinal decisions, events could become unpredictable. "The psychological condition of the people has reached an irreversible turning point and the situation is fraught with social upheavals," Deputy Valeri Krishevich stressed.

Parliamentarians also said that against the background of Chernobyl tragedy's aftermath and the utter misery of tens of millions of our fellow citizens we could not afford such undertakings like countless seminars, conferences, symposiums and other formal functions which are unnecessary and burdensome to our bankrupt treasury. Couldn't we reduce at least for the time being, the number of various "shows", and festivals so inappropriate in our present economic and social situation?

Much criticism was levelled at science in general and individual scientists in particular, on account of their concept of "normal existence" in territories with per capita radiation dose of 35 rem, and also for their tendency to strictly classifying all information on the subject (and thus leaving then nation in the dark).

Deputy Vasily Belov stated that science which had allowed the Chernobyl catastrophe to occur was immoral, and the society which developed and encouraged such science was careless. "We are being spoonfed with promises of complete reliability of nuclear power plants. Yet, we have all become hostages of this deadly, devilish force - the atomic boilers which are spread across the land in great density." He cited many hushed up cases of nuclear plant disasters in various regions during the last fifteen years.

> *"Recent studies by Soviet experts show that some of the earlier predictions regarding the long term health consequences of Chernobyl and the number of people affected by the accident were way of the mark. I think we should compare the 32 human deaths due to Chernobyl with the over hundred people who have died due to the recent accident on an oil platform in the North Sea."*
> *Dr. M.R. Srinivasan in Sunday Observer of 24 th July, 1988*

Yevgeni Velikhov, Vice President of the USSR Academy of Sciences, and one of the topmost nuclear experts in the country, when given the floor, held forth about the "Chernobyl " charity" TV marathon, about how scientists had frequently visited the site of the disaster, and about the need to remove nuclear fuel from the "sacrophagus". Dr. Vlikhov stated that the problems of the polluted territory inside the 30 km zone closed to people would be tackled within the next five years.

But what about the radiation danger to people outside the "death zone ?" Dr. Velikhov called for "avoiding exaggerations and unverified information." And he cited an example about himself; "The 40 or 50 roentgens which we professionals usually get are quite a normal dose, which does not pose any threat to my organism in my view."

A very typical comment! While nucleocrats dismiss claims that any particular case of cancer could have been due to radiation, they do at the same time offer absence of discernable health effects in a particular case as 'proof that radiation at that level is 'harmless' to all.

The programme adopted by the USSR Supreme Soviet envisages an improvement of medical care and the improvement of the environment in polluted territories, the registering of all who lived or worked in the danger zones, the creation of a "Children of Chernobyl" programme, and the drafting of a special law on the Chernobyl catastrophe.

Sixteen billion roubles have been year marked for the implementation of the programme, which is equal to the annual surplus of the country's national income. This was announced by the Prime Minister Nikolai Ryzkhov, though he added that this money had yet to be earned.

CHERNOBYL SARCOPHAGUS IN DANGER

Seismic activity has recently boen recorded in the vicinity of the Chernobyl nuclear power station, causing Soviet decommissioning experts to fear that the sarcophagus covering the unit could crack, allowing further releases of radioactive materials.

According to the documents obtained by *Nucleonics Week*, Soviet officials notified German Ministry of Environment and Nuclear Safety (BMU) that tremors had recently been recorded in the vicinity of the reactor and the sharply inclined roof of the reactor could shift despite remedial measures taken to keep it in place. They also said that the concrete walls of the sarcophagus and the reactor floor are unstable and could collapse.

German documents state that if the sarcophagus were to open, the volume of radionuclides released as dust from the reactor could be nearly twice the inventory by percent released during the 1986 accident. Following that accident only about 5% of the total radioactive inventory was released to the outside whoreas nearly 95% was retained within the reactor. German experts fear that is the sarcophagus collapses, the remaining radiomondes would be thrust outward by heat and air currents further contaminating the surroundings.

Because of the seismic activity, The Seviots are now backing away from their original Plan to build a second sarcophagus to cover the first. because it, too, would be vulnerable to tremous Instead, they now favour dismantling the reactor and decommissioning the site, decontaminating it to the "green-field" level. Western experts view this as impractical. According to Enno Hicken, a senior reactor safety expert at the Juelich Reserach Centre (KFA), the difficulties of dismantling smallo reactors without the additional problems associated with a severe accident, were "already considerable."' And unlike Three Mile Island Unit-2, he said, the fuel and fissile material inside Chernobyl-4 is widely distributed. The thermal and radiological conditions inside the core at present would prove too much for even state-of-the-art robotic equipment. Because of the great volume of contaminated dust inside the sarcophagus, Hicken doubts that the site could be decontaminated without the construction of a second sarcophagus to contain the dust for several decades, regardless of the threat to such a structure posed by earthquakes.

Besides the danger posed by earthquakes, there are other problems as well. One danger is that the fuel that is left in the reactor core could become critical if it was moved around or became compacted. Since the enrichment level of the fuel is only 2% U-235, the chances of recriticality are "slight." However, this analysis fails to take into consideration the chances that the sarcophagus could collapse.

Additional problems include one raised by a former senior Chernobyl engineer who was elected to the Ukrainian parliament in March. In an interview in July, he told the daily *Sueddeutsche*

Zeitung that a 1,000 square metre area of the sarcophagus had been softened up by neutron bombardment. According to experts, present emission levels measured outside the sarcophagus are 40 billion Becquerels per day which is incidentally five times the daily limit allowed for German reactors. The radiation which is escaping the sarcophagus from a number of leaking points, is carried out by strong convection currents generated by the high heat inside the reactor building. The temperature inside the sarcophagus has been measured in some places to be as high as 200*C. Western experts say that the large amounts of boron carbide and sand dumped into the reactor to extinguish the fire in 1986, may now be inhibiting decay heat dissipation now.

Sources :
Sputink : Digest of Soviet Press, September, 1990
WISE News Communique : *340, October 19,* 1990

New Clear Technology - Murky as Ever !

Nucleocrats are a hardy breed. They would like the public to think that nuclear industry is not dying at the hands of the marketplace. Hence, lately they have begun to argue that a combination of concerns about the greenhouse effect and the new "inherently safe" technology will revive the nuclear power industry. Forbes — a business magazine from USA — (which had once written an article highly critical of the nuclear industry and has never fail, d to pat itself on the back for it) now says in an article entitled "The Greenest Form of Power"

> *"Nuclear power is not dead. It is just sleeping. Solar power and wind power and the like are pie-in-the-sky, clean safe nuclear power is a reality. "*

Richard K Lester, a professor of nuclear engineering at MIT, in a similar vein :

> *"Second generation nuclear technologies would reestablish nuclear power as a major source of electricity."*

While according to the President of American Nuclear Energy Council :

> *"Nuclear energy must be revitablised in order to alleviate the greenhouse effect."*

A politician who has clearly been seduced by these new non-existent reactors is the Australian opposition spokesperson on energy, Senator Peter McGauran. In a confidential June 1989 memo he says :

> *"You would know that new generation reactors which maximum safety features are now coming into use. They are small (250-400 MW) and fully automated, and overcome the many safety problems associated with large-scale reactors of the past*[4]*

Senator McGauran has jumped the gun here : not one of the advanced reactor concepts he mentions has actually boon built. Nothing more constructive than design studies have been done. In the same document he rhapsodizes that :

> *"Recent reactor designs are particularly impressive. They are easily operated, and have phenomenal safety advantages.*[44]

In a way, Peter is right : everyone would agree that non-existent nuclear reactors do have phenomenal safety advantagos.

So is new technology really the answer to nuclear industry's prayers or is it just the proverbial grasping at strws. Unitl now the dominant nuclear technology has been PWR and the BWR, with a few doddery magnox and AGR in UK, a few surprisingly good CANDU performers in Canada, South Korea and Argentina, and unspeakable RBMKs in the Soviet Union.

> An editorial aside :
> While the CANDUs have been good performers elsewhere, there performance in India has been uniformly awful. Also it is interesting to note that while abroad nuclear propagandists are extolling new (as yet on the drawing board) technology whereas in India the Nuclear Power Corporation has been taking out advertisements staunchly proclaiming the invincibility of the present generation of reactors.

These 'old technologies', it is argued, are too big (1000 - 1200 MW) and too costly ($2-4 billion) to fit easily into third world electricity grids or US utility budgets or planning horizons. They rely on complicated, active, 'add-on' safety systems that cannot be relied upon and cost a lot of money. They take a long time to build; partly because of their sheer scale, partly because of the regulatory problems that arise (mainly US, but also West Germany, and even in the UK), because each reactor is 'custom designed' and different; and thus has to have its entire design verified by safety authorities; and partly because engineering giants such as Betchel in the US have a way of doing things like putting in 1400 electrical circuits back-to-front, like they did at the Midland plant before it was abandoned. Finally, the PWR and BWR designs are conceded to contain real inherent safety problems — at least by engineers who are proffering alternative designs. Those who argue for 'now generation' nucler technology in this way concede much of the safety case nuclear critics have put up for years.

But, we are told, the answer is not to opt for low energy, conservation-oriented society. Technology forbid! Clearly the answer must be new technology. And so a new generation of reactor technology is on the drawing board whose characteristics are supposed to be :

Relatively small size (150-400 MW)

Modularity: Rather than say 1,000 MW units, reactors will come in, say, 600 MW 'clusters' of 4 x 150 MW, or in lines of identical units of upto 400 MW.

Standardization : No more custom built monster power plants. Instead, identical units of much smaller size are to be factory made on an assembly line.

Reliance on 'passive' safety features : new reactor designs are to rely on gravity and natural circulation to get rid of heat, not an 'active' features such as pumps.

'Automatic' shutdown : In designs such as PIUS, borated water is supposed to flood the core and shut the reactor down if anything goes wrong without the use of pumps.

'Forgiving' operating characteristics : If something does go horribly wrong, you don't have just 30 seconds like at Three Mile island, to flood the core before the fuel starts to melt, or just about 3 seconds as at Chernobyl, for an emergency forced shutdown before the reactor goes prompt citical and blows up. You are supposed to be able to walk away from designs like PIUS and MHTGR for days on end before anything actually needs doing — or atleast, that's the ideal.

Apart from the still insoluble waste problem, and besides being the most costly way of cutting the greenhouso emissions, what else could possibly be wrong with these lovely new technologies ? Let us look at them one by one.

High Temperature Gas-Cooled Reactors (HTGR)

The HTGR is or was my favourite nuclear reactor. Unlike the PWR, BWR or CANDU, the HTGR doesn't have a lot of water inside a breakable pressure vessel, trying to keep the fuel from melting. Instead, it has a much bigger graphite core cooled by circulating helium gas at a relatively low pressure, but with a much higher temperature than the present generation or reactors. Thus, it is able to heat water inside its steam generators to high (and much more efficient) temperatures typical of fozzil fuel generating stations.

Actually HTGRs are not all that now. They are the descendants of the old English Magnox and AGR plants whose performance to date has been uniformly awful. USA's 300 MW prototype HTGR at Fort St Vrain was recently shut down because of embarrassingly bad performance. The West German THTR, a unique 'pebble bed' reactor, was shut down before it had even boon properly commissioned because after relatively minor problems with fuel damage and snapped bolts in its gas duct, it was felt by its operators to be a financial meltdown in the making.

With a lineage like that, why the optimism about HTGR and MHTGR (Modular HTGR)? Well, it seems that General Atomics - the people who gave the world Fort St Vrain - have now teemed up with Siemens and HTR-GmbH of West Gormany to built a small (80 MW) MHTGR prototype inthe USSR at Dimitrovgrad. And in the meanwhile General Atomic's MHTGR concept has been selected by the US Department of Energy (DOE) for one of the two now plutonium production reactors for military uses. DOE has also increased its funding for civilian MHTGR technology.

But all is not smooth sailing for MHTGR. For one thing, the company isn't happy that DOE wants it to put a containment on the reactor. They are 'inherently safe' you see, and therefore, the company contends there is no need for a costly containment building. The company also feels that DOE's insistence on a containment would set the wrong precedence for civilian MHTGR reactors.

Yet, according to Advisory Committee on Reactor Safeguards, a fire in the HTGR's graphite moderator could happen if the reactor vessel or the core support system failed, resulting in "severe consequences".

The HTGR will need a lot of governmental help. A prototype HTGR is estimated to cost $ 1.8 - $2.1 billion for 400 MW capacity — no cheaper than the financially disasterous present generation of reactors. The claim is that if prototype costs are met through government subsidy, subsequent reactors would be cheaper. Robert Pollard of the Union of Concerned Scientists says "The nuclear industry should join the free enterprise system."

The time horizons being talked about by DOE are interesting as they indicate that the MHTGR, though the most 'advanced' amongst the now reactor concepts, is still very far from being a reality. A feasbility study for a 4 reactor, 500 MW civilian plant was nearing completion in March 1990 *[Nuclear* Engineering *International* March, '90). The study was done in part "to determine what government support would be necessary" to build a lead - plant "after the turn of the century." DOE itself is saying that MHTGR designs should be certified "early in the next century." This means that their construction won't even start till past 2000 - 2005 and that means that there won't be any MHTGR in the US till 2010.

Process Inherent Ultimate Safety (PIUS)

Meanwhile ABB-ATOM of Sweden and United Engineers of US have teamed up to market the PIUS design in the US. (Nuclear Engineering Internationa], August, 1989)

The PIUS design originated in Sweden, and envisages the entire reactor core being submerged in borated water, which normally prevents a nuclear reaction of any kind. Any minor deviation from normal operation allows the borated water to enter into the core and stops the reaction. The only problem is that the whole design concept has never been tested : no one has actually built a PIUS of any size, not even a 5 - 10 MW, so there is absolutely no guarantee that the thing would work at all.

PIUS is also in fact, not toally immune to catastrophe. It is possible for **the** vessel containing the core to rupture. Also it seems likely to he very costly.

Other Designs

Besides PIUS and MHTGR there are a bewildering multitude of 'inherently safe' designs floating around. DOE favours a liquid metal cooled reactor called PRISM, which doesn't seem to be inherently safe at all! It depends on liquid sodium for heat transfer - with all the potential for fireworks that implies. There is a chance that if the sodium coolant were lost the reactor would blow itself apart. About the only real safety advantage of PRISM seems to be that it takes a while to heat up if circulation pumps fail. PRISM like MHTGR is supposed to come in nice bit-size 135 - 150 MW x 4 bundles.

Other 'new' reactor concepts are GE's SBWR, a sort of simplified BWR. It is very similar to ABWR (Advanced BWR). GE is developing this in partnership with Toshiba and Hitachi of Japan. ABWR does seem to have a good chance of actually being built, but it is hardly a 'new' technology — rather it is the development of existing BWR design. With the continuing slowing down of Japanese reactor construction programme, it is unlikely that more than one ABWR will be built.

Another Japanese design is the 'System Integrated PWR' (SIPWR), a unique PWR with the troublesome steam generators inside the reactor vessel. Given the trouble there has been with steam generator leakage and replacement, this doesn't seem to be such a good idea: when the SIPWR has steam-generator problems they have to replace the entire reactor. Needless to say that no one has built or ordered one yet. (NEI, November, 1909)

It is interesting that at a recent IAEA forum, thee were some speakors who criticized the new technologies. Former US AEC Chief, James Schlesinger said that while the new technologies would probably be developed, there was no guarantee that they would ever be employed *{NE1* Nov. 1989) Schlesinger favoured 'evolutionary' design such as ABWR or SIPWR which he felt might be ready by the 1990s.

Others in the nuclear industry have also suggested caution over the now design. At a conference in Madrid, the chairman of the European Nuclear Society, Hans - Honning Honnies, said that what would influence the public wasn't exotic new design but a proven safety record, and in order for ' current levels' of performance (!) to be achieved, about thirty years of operating experience would be needed. But these speakers while denouncing new nuclear technology wore quick to minimize **the problems faced** by **the current generation of** nuclear reactors !

The upshot of all this is **that 'new generation'** nuclear technology is being marketed with the same unjustfiable techno-optimism and hype as was the old technology, and with even less justification.

Some of the new 'inherently safe' technologies such as PRISM seem to be as inherently unsafe as their FBR cousins, but use the excuse of claimed inherent safety to dispense with containments. Others like PIUS or MHTGR, might have been **a** good idea if they'd have had prototypes deployed some twenty years back, so we could now build a few standardized designs based on solid operating experience - if we weren't sensible enough to opt for energy efficiency instead. As it is if governments foolishly make a substantial commitment to one of these technologies now, they would have the first operating prototypes by say 2010 - 2020. The greenhouse problem by then would have become a whole lot worse, not in the least because money spent on costly nuclear power would save 7-10 times loss C02 than if it had been spent on energy efficiency. *

Inherent safety is the functional equivalent of too cheap to meter.'

Inherent safely is the functional equivalent of too cheap to meter.'

Back to **the** Real **World**

Meanwhile the nuclear power industry keeps slowoing down - the number of reactors under construction continues to drop. According to the industry publication Nuclear Engineering International there wore 109 plants under construction worldwide in December, 1988. By December, 1989, the number had dropped to just 97. Since then more plants in the USSR have been cancelled. According to latest US estimates only four reactors with definite operating dates are still under construction in the US, with nothing not subequently cancelled has been ordered since 1973.

Nuclear programmes in the two great 'successes' of nuclear power, France and Japan too are slowing down. Nuclear ordering in France is on the verge of a complete halt. UK's ambitious PWR programme has been completely scrapped, with construction proceeding only at Sizewell-B.

A recent Greenpease report estimates that world's nuclear capacity would peak in 1995-96 and would be on the way down by the beginning of the new century.

John Hallam
Chain Reaction
Friends of the Earth,
Sydney, Australia

Testimony

Stoke the furnace, gramma used to tell my daddy-
he'd roll up his sleeves, obediently, and shovel in more lumps of coal;
i watched the fire from the basement steps; innocent, mesmerized
by the crimson flames crackling behind the window into hell;
only my young heart, thump-thumping, recognized the danger.

One day, the coal man came-menacing, dirty man; delivering clouds of dust;
quick, run upstairs into the attic, climb into gramma's trunk from the old country;
ah, just enough to hide a wee one.

i read it in the newspaper:
"hanford....forty years ago....twenty thousand boys and girls, especially babies....
higher doses of radiation than any incident since the dawn of the nuclear ago.
....secrecy maintained....till now...."

Murky clouds choke out the sunlight; how could they do this to me?
like an abusive parent hiding behind the facade of a respectable home,
the government counts the children among their possessions;

Illusions about government's parental role vanish, but couldn't they say they're sorry?
don't you understand? i wasn't for sale!
not to anyone; not for any reason; most certainly not as a guinea pig!

Rage-shouting, kicked in the gut, "i could kill" rage! who the hell is responsible?
i feel like a blob of raw meat, vulnerable beyond my wildest nightmare;
the fire is seething, rumbling, multiplying like molecules of yeast;

Life is suddenly more precious, more precarious, too;
shall i hide? or go onward into the flames?
what is that noise? my soul, pleading; i'm afraid they'll find me wherever i go.

Remember pogo, a little voice whispers-i've seen the enemy and they is us;
yes pogo, and they is me, too.
you will take care of things, won't you?
creditors are breathing down our neck; we leave on vacation next week;
we have other plans; we're too busy; we don't feel well, maybe later.

Oh, we do some church work; toss some coins in the kettle, even helped a neighbour last week;
attention everyone, please appreciate our generosity;
how righteous we are!

We have fueled the fire with our silence; words unsaid and deeds undone reduced to ashes?
have i been a victim? yes, but so have you!
shall we-you and i-continue to feed the furnace?

Or is it time to gather up the shattered shards from dying coals? is there enough time
to forge a discerning sword? are we willing to risk living love with a thinking heart?
i must-or the flames will consume me.

Arlene Hetherington

Arlene *Hetherington grew* up in Spokone, *Washington. She was nine years* old *at the time of the* deliberate *Radioactive releases from the US* Government's *Hanford* nuclear reprocessing plant *known-as the Green* Run Experiment in 1949. When *she was in* her *thirties, she developed large tumours* on *her thyroid* gland *that* threatened to obstruct her *windpipe. This led to several* surgeries. *When physicians removed the* tumours, *they were found to* contain pre-concerous cells. She now *lives* on Bainbridge Island *and is employed as* a tourism planning *consultant.*
Source: HEAL PERSPECTIVE Vol. 1 No. 3. fall 1990.

REVIEWREVIEW

Earth Rising

David Oats
Oregon University Press 1989

Earth Rising
David Oats
Oregon University Press 1989

The farmer in India considers listenning' the most important way of learning agriculture. For generations the advice that is handed out is "Go early in the morning to the farm. Go around the entire field and visit each and every plant. It will tell you what to do!" The field, the soil, the crop, the birds, the insects, the water and even the early morning rays of the Sun speak to the farmer. This closeness, in fact, identification with every living and non-living being is considered as the obvious way of a farmer's life.

This oneness with 'life' - an understanding though both obvious and simple is yet to dawn on the modern man'! The SCIENTIFIC man! David Oats is like an early bird announcing the coming - "EARTH RISING". Incidentally, the cover of the book is a beautiful photograph taken from the moon by the members of the original moon landing mission.

> *"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising*'*

"Nowhere in the Solar system is the contrast between a dead and a living planet so conspicuous as on the Moon with Earth Rising"

The book is a manifestation of a vision. The vision for home sapiens to mature and belong to 'Gaja' - the superorganism. 'Gaja' hypothesis as proposed by James Lovelock, suggests that Earth's atmosphere and the oceans are maintained as highly sophisticated buffering devices by the totality of life on the planet. The whole Earth, in other words, functions as a single organism - Gaia. Gaia was the name given to the Earth Godess by the ancient Greeks.

> *Humans! I Mountain am speaking. You cannot ignore met I have been with you since your very beginnings and long before. For millenna your ancestors venerated my holy places, found wisdom in my heights, I gave you shelter and far vision. Now, in return, you ravage me. You dig and gouge for the jewel in the stone, tor the ore in my veins. Stripping my forests you take away my capacity to hold water and release it slowly. See the silted rivers? See the floods? Can't you see? In destroying me you destroy yourselves. For Gala's sake, wake up!*
>
> *Pat Flemming and Joana Macy:*
> *Thinking like a* Mountain

The author does not run down science or 'progress' as such. The scientists are maintaining empirical rigour and skeptical inquiry: the farmers are trying to wrestle with the whole fact of existence, to bring coherence out of it. Real *people need both approaches.*

"The essential gesture of ecologism is an act of deference to the natural world: one adopts an atitude of seeking or listening rather than imposing ...."

Especially potent is the principle of ecological balance, derived from the vision of a stable ecosystem. Recycling cans, bottles, paper, whatever is a ready example, trivial though it may appear on the surface Behind this practice lios the notion that our cultural habits of consumption and waste ought to be replaced by the habit of gaining the most out of raw materials by using and reusing thorn frugally to ensure enough for tomorrow and for tomorrow's tomorrow. Ecological thinking stresses that human society ought to find a balance between input and output so that nothing essential ever truly runs out.

"Skills unpreventably give pride and confidence. They won't build your character necessarily, but they will unable a breadth of experience where character might clarify. A wealth of skills docs not ensure freedom any more than any other wealth, but it surely can expand choice, which may lead out of some corners. As for wisdom, that's the name for the sustained habit of paying attention, of learning larger by learning longer."
Stewart Brand

Formula for an interesting life: Acquire skills and use them. The more skills, the more interesting the life.

From seeking this balance, understanding it, we go through Cooperation, Cybernetics, The Natural Mind and Ecological Ethics. The chapters unfolding in a manner that can be termed 'natural' - unfolding ideas like a bud; opening the leaves slowly, silently, positively and refreshingly fresh!

Hence the reader enjoys the spectacle of nature while reaching for wisdom!

Walter R. Canon in his The *Wisdom of the Body* (1932) provided an early glimpse of the deep inter-connectedness of different kinds of biological systems. The book is about the human organisms ability to regulate its internal state; keep its temperature, fluid levels and concentrations and the like within acceptable limits. Canon's term for this process was *homeostasis* - the means employed by more highly evolved animals for preserving uniform and stable their internal economy... He applied homeostasis to other biological systems and carried this process right up the scale from single cells to human civilizationa. *"Just as in the body physiologic, so in the body* politic, *the whole and its parts* are mutually dependent; *the welfare of the large community and the welfare of the individual* members *are reciprocal............*"

David Oates discusses Bill Devall and George Session's 1985 book 'Deep Ecology - Living as if Nature Mattered'. The book follows the insights provided by the philosopher Arne Ness.

"Ecology as a science does not ask what kind of society would be the best for maintaining a particular ecosystem - that is considered a question for value theory, for politics, for ethics. As long as ecologists keep narrowly to their science they do not ask such questions. What we need today is a tremendous expansion of ecological thinking into what I would term 'ecosophy'... a shift from science to wisdom." In the author's view, 'Deep Ecology' "Is trying to exclude a large part of the ecological movement from full membership." The suthor rightly stresses the need for inclusion of all efforts also contradictions.

The author feels that the ecological world-view has found its way through the eightees with surprising vigour. His assertion that, "It seems certain that the physical realities of the earth, as well as the psychological and spiritual needs of its human inhabitants will guarantee an interesting creative future for the world view of ecology." is a view with which we cannot but agree.

"The meaning of life to Faustian man, is will and victory. The meaning of life to the ecologically wise, is *life itself,* over which "victory" is a meaningless concept. Wisdom takes satisfaction in understanding the limits of power, how to avoid hurtful exertion within a naturally balanced whole. Knowledge is very strong, and is in many places around us transforming the world for the worse. Only character can remake and control this knowledge; only the wisdom of the centered, balanced person, who knows that life and mind are part of the earth itself."

Copernican view shifted the world from the centre of the universe; the ecological view attempts to shift humans from the centre of all life on earth. For all of us who are looking for "life" this book has covered the major grounds so far. This is an important book, if not the book to gain an insight into the ecological world view.

Jyotibhai Desai
Vedchhi

EMERGENCY PLANNING

IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
Proceedings of a Joint NEA/CEC Workshop
OECD Paris 1989

EMERGENCY PLANNING

IN CASE OF NUCLEAR ACCIDENT
TECHNICAL ASPECTS
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....

The Nuclear Energy Agency (NEA) was established in 1958 with the aim of furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source. The agency organises workshops and seminars at which participants can exchange tochnical information and harmonise national regulatory practices.

Emergency Planning in Case *of* Nuclear Accident is a collection of papers presented at a workshop held in Brussels on 27th - 29th June, 1989. It thus represents some of the latest (post Chernobyl) thinking on the subject in the rich countries of the world. This book is an important contribution and deserves to be resd especially by public authorities who have boon entrusted the task of ensuring public safety during nuclear emergencies. It is divided into four sections besides the overview. The topics dealt include the basis for emergency planning, surveillance and monitoring, experiences from chomical emergencies and from conducted exorcises.

The major shortcoming of the book is the fact that it is written in oficiallese. Perhaps that cannot be helped since it is a collection of documents written by officials and for officials. Nonetheless it does make reading the book a chore. However, a diligent study does bring forth some useful nuggets of information. For example : there are separate considerations that need to be taken into account while doing emergency planning. In the zone immediately next to the nuclear facility the main considerations are protective measures like evacuation, sheltering, thyroid blocking that are of primary importance while in the regions some distance away one needs to plan basically with a view to control foodstuff and water. USA has the largest emergency planning zones of any country. The primary zone there extends up to a radius of 16 km from the plant site while the secondary zone extends upto 80 km. Contrast this with India where the primary zone is just 8 km. and the secondary zone just 16 km from the plant site. But contrast both with what happened at Charnobyl. There, people within a radius of 30 km had to be immediately evacuated while hot spots (regions with abnormally high radioactive contamination whose agricultural produce is unfit for consumption) were found hundreds of kilometres away. Thus, one finds that contrary to oft stated assertions, the lessons of Charnobyl have still not been learnt anywhere in the world. Nucleocrats are yet placing unbounded faith on that totally discredited axiom : "Nuclear disasters are extremely rare events and more severe the accident the less its likelihood of occurance."

Similarly, it is interesting to note that intrvention levels (guidelines to decide appropriate protective measures) vary from country to country. While in Germany, sheltering is advised for a dose of 5 m Sv and is mandatory above 50 mSv, in the UK it is advised at just 3 mSv and becomes mandatory at 30 mSv. For comparision, in India, sheltering won't be resorted to till an exxternal dose of 10 mSv is reached though it is mandatory at or above 50 mSv.

Priced at 220 French Francs for the paperback edition the book, is way beyond most Indian pockets. But it may be a good buy for libraries and documentation centers. Needless to add that it is extremely well produced in terms of printing binding and get-up.

EXCERPT

Now accident analyses represent substantial advancement in many areas. Perhaps the most important conclusion is that large early releases given a core melt accident still seem possible. Thus, provisions must be made for coping with such releases, so the scope of emergency preparedness cannot be reduced at this time.

A second very important conclusion is that the time and the magnitudes of releases cannot be predicted by the operators with confidence in real time. After over 20 years of study, there remains considerable uncertainty and controversy amongst experts regarding the timing and magnitude of source terms.

Source term :

Radioactive release during *an accident*

There is important positive information. First, there should be at least two hours warning before a major release, so early emergency response could prevent fatalities regardless of source term. The new analysis describes core melt accident as unmistakable by the time core damage starts. With the cooling provided by natural circulation, melt-through and a substantial radioactive release to the environment should be at least two hours away. This time can be used effectively by poople if they are provided early warning.

Secondly, early evacuations even within only two to three miles of a plant can substantially reduce the conditional risk of early fatality and injury, regardless of the source term.

This is consistent with other reports in the US that risks do reduce markedly during the first two to three miles and then slowly thereafter. Fortunately, much more time would be available for radiological monitoring teams to identify hot spots beyond this distance - where relocation from shelters might be prudent or necessary.

The overall implications of these new studies for emergency preparedness are :

Don't delay an evaluation within two to three miles if a core melt accident is indicatod.

Monitor for hot spots as soon as possible after a release.

It is important to remember that core melt accidents are not expected. Thus a protective action scheme based on initiating early precautionary evacuations for a core melt sequence but not otherwise, would accomplish as several things simultaneously :

Planned evacuations should be vrry rare, since they are warranted only by core molt accidents.

Prudent, precautionary evacuation would be initiated early, for cause.

Early evacuation within two to three miles considerably reduces risks (by a factor of ten or more).

Hot spots beyond two to three miles can be readily identified after a release and relocation from them can be accomplished in a more leisurely manner to accomplish dose saving objective.

EXPLOSION AT SOVIET FUEL FABRICATION PLANT

The official Soviet news agency Tass has reported that an explosion took place on 12 September '90 at the Soviet fuel fabrication plant in Ust-Kamenogorsk in Kezakhstan, a city with a population of a half million, located near the border of the USSR, Mongolia, and China. According to Tass, no fatalities occurred, but many people are said to be injured. Panic broke out and many left the city.

Tass stated that the explosion occurred in an underground beryllium production facility, Ulbinsky metallurgical works, causing a fire which resulted in a gas cloud that moved out over the area. The toxic gas containing beryllium hung over residential districts for most of the day before being dispersed by the wind. Days later the streets and houses were still being hosed down to keep poisoned dust from flying into the atmosphere.

The area has been declared an ecological disaster zone. Separate reports say, however, that a medical team from Moscow has determined that there is no risk of substantial health effects on the local population (where have we heard that before!), although some areas are contaminared with beryllium at 60 times the allowed level. It has also been stated that the facility will be closed though no date was given.
Source:
WISE *NEWS COMMUNIQUE 339 340.*

LETTER BOX

To sin by silence makes cowards of men. Let them who dare, speak and speak again to right the wrong of the atomic lies."

This is in reference to your editorial in Vol. 4 No. 1 regarding the unjust dismissal of Prof. R.G.V. Menon. I have closely watched the operations of Atomic Energy Commission since the days of Dr. Bhabha. Throughout, it has been a performance characterised by lies and lies only and the people have had to pay the price for nucleocrats' folly.

Prof. V.L. Talekar
C-169, Bajaj Nagar,
Jaipur 302015

I have been reading every bit of Anumukti since December 1989. In the June/July '90 issue there was a very good story under the title "Dirty Tricks of Decent Men" on renewable energy sources written probably in response to Dr. M.R. Srinivasan's published observations regarding renewable energy sources.

Till recently the Department of Non-conventional Energy Sources (DNES) was headed by Dr. M. Dayal, who used to be chief superintendent of Tarapur Atomic Power Station a long time ago. Now, after retirement from DNES he has returned to Department of Atomic Energy and is now posted in Nuclear Power Corporation's Delhi office as a Senior Technical Advisor. The overall prospects for renewable energy sources in India are just as bleak as those for atomic energy.

During the coming decade, say even by 2010 neither atomic energy nor new/renewable energy sources will contribute much to the country's requirements. Fossil fuels like coal, oil/gas and hydro will continue to dominate the energy scene.

Truly speaking scientific temper has not yet developed in the country. We only do our accounting in terms of per capita electric power consumption. We are least bothered about the proper and judicious utilisation of the abundant natural and human resourced available in the country. The politicians, bureaucrats and technocrats have developed a nexus among themselves to propagate and promote their vested interest at the cost of the poor. They have invented very treacherous and tricky terminology like "socialistic pattern of society", "poverty removal programme", "Jawahar Rojgar Yojana", and the very recent "Mandal Commission".

While energy conservation has become the foremost agenda for advanced countries, this is the least talked about item among both government as well as voluntary agencies in this Country. Electricity generation industry in India has a huge potential to improve capacity and availability factors. Just the leveling of peak demand would Yield at least 15 to 20 percent. The transmission losses in India are the highest in the world. Thus, there is ample scope for improvement. But neither the pofticians, nor the bureaucrat or the technocrat have bothered to do anything in this direction. In every sector of our economy, the picture is the same whether it be chemical industry, transport or agriculture. There is everywhere misutilisation. Either there is underutllisation or there is over-utilisation. For examples of the latter just think of suburban trains or buses in Bihar or the trams of Calcutta. We are living in poverty as well as plenty.

Dr. *G.G. Prasad*
7-C Kedarnath,
Anushakti Nagar,
Bombay 400094.

I am writing this letter on behalf of our small group NILA which is working on environmental awareness. At present we are campaigning against the proposed nuclear power plant in Kerala. On October 2nd we will be organising a protest march at Kottayam in which prominent public personalities like V.R. Krishna Iyer and Sugatha Kumari are expected to join with us.

I read "Chernobhata?" in Third World Network Features No. 486. I would like to have more information regarding issues related to nuclear energy. If you could send us some materila, that would be a great help in writing about the issue in Malayalam. We will be translating "Chernobhata" and publishing it in Kerala shortly.

Since we are here in a small village, gathering information is not easy. So please help us. Also send a note about the materials available with you, so that one of us might come to Vedchhi to refer to it.

Abey George
Ayamkudy, P.O. Muttuchiro
Kottayam, Kerala 686613

Editor's Note :

Over the years we have collected an enormous quantity of material regarding various facets of the nuclear issues. Also, since we too live in a small village, xeroxing the material is not easy and entails a long trip. We do try to send copies of material with respect to some specific requests. However, Abey George's idea of someone coming to Vedchhi to sort through these piles is most welcome. All are welcome to come anytime and research the material.

DISQUIETING ADVERTISEMENT

A recent advertisement by the Nuclear Power Corporation features glass of milk and some vegetables in an attempt to convey that a nuclear reactor is just as harmless. As irrefutable proof it gives radiation levels in terms of milllrems from different natural sources and compares it with the expected level of emission from a reactor. But the trouble with the radiation estimate is that it represents the ideal, even wishful figures as if already achieved nay as if they wore the basic characteristic of the plant. This way, what is inherently unsafe is made acceptable.

The true story of nuclear programme everywhere is heavily stained with accidents and leaks and an aggresive cover-up of it by the state run agencies. While the mighty explosion at ClOrnobyl was sufficient to seal the fate of nuclear power in most countries, we in India are still planning a ten-fold increase.

The very beginning of the nuclear cycle, the process of mining and refining radioactive materials, is one of indifference to health of workers and the local population. A few years back, V.T. Padmanabhan published his findings of the hazards created by the Indian Rare Earths Plant at Alwaye, Kerala which established beyond doubt that the people working in the plant had a far higher incidence of radiation related diseases than those working in other industries in the region. The Times *of India* in its main editorial had called this "Disquieting News".

Even in industrially advanced countries independent research on the health of workers in nuclear plants and on people living in its vicinity has confirmed that the claims being made by nucleocrats are an eyewash. At Sollafield nuclear reprocessing plant in the UK, it was found that the levels of leukemia and non-Hodgkin's lymphoma were ten times as higher than expected for local children.

An advertisement that equates the harmful effects of a nuclear plant with a glass of milk and vegetables sounds a gruesome joke.

Kersi *Sabavala*
Mohite BIdg. near *Amardeep Apt. Baroda 390001*

Editor's Note :

No, the trick Is not in presenting ideal figures as actuals though there is that of course. The real trick lies in averaging. Consider any nuclear plant however badly run, say Chernobyl for example. The average dose to the people of the world from Chernobyl has been less than the natural background since most people in the world do not live near Chernobyl. Even the number of fatal cancers produced by the Chernobyl disaster, though it may eventually be well over a million, is negligible in comparison to the 'natural' occurence of cancer in the world. Thus, by averaging over a large enough area any polution can be shown to be much less than the 'natural'. The trouble is that there are a large number of people who receive a dose which is much larger than the average.

NUCLEAR NOTES

SOVIET N-PLANT SINKING? The Kalinin nuclear power station, 100 km north of Moscow, could sink into the ground at any time, resulting in another Chernobyl. According to Nikolai Gladkov, chief hydro-geologist with the Kalinin Geological Survey, the station is built on karst limestone which is full of hollows and crevices. To make matters worse, the two new units now being built will need subterranean waters for cooling. Gladkov warns that pumping water could cause a "sudden catastrophic" subsidence.
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Anumukti staff regrets the late publication of this issue. All sorts of causes, from Diwali to riots to computer viruses conspired to bring about this unwelcome outcome. We hope to bring out the next issue by the 15th of December.

PRINTED MATTER
BOOK POST

ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 3 **December 1990 / January 1991**

धर्मक्षेत्रे चान्दपुरक्षेत्रे समवेता युयुत्सवः . . .

Today Mahabharat is being fought once again. I don't mean the carnage in the Gulf. That is modern warfare— totally bereft of morality, purpose and meaning—a war to test the war machine.

The setting of Mahabharat is the border of Gujarat and Madhya Pradesh at a place called Ferkuva in Gujarat and Chandpur in M.P. On one side is a large band of about to be dispossessed people, whose battle cry is *"Koi Nahi Hatega — Bandh Nahi Banega."* They are willing to die, but are not willing to be made into sacrificial goats. On the other side supposedly is an even larger army - people involved in a 'Mahayagna' to a Goddess called 'Development' whose battle cry is *"Jeevadon"* (Sardar Sarovar Dam is Gujarat's lifeline.)

For me the analogy with Mahabharat was brought into sharp focus because I saw Chunibhai Vaidya In the camp at Chandpur. Chunibhai to me, has been for nearly two decades now, a great hero. During the dark days of emergency, when many a stalwart in the press had decided that silence was indeed golden, Chunibhai's voice in the *Bhoomiputra* was a stilting call to freedom. Despite persistent persecution by the government he had remained unbowed and defiant. Today however he had come as one of the leaders of the pro-dam agitation having being sent by the Chief Minister of Gujarat to parley with the leaders of the anti-dam agitation.

The position of the pro-dam rallyists can be briefly summarized thus:

- The entire people of Gujarat support the construction of the dam.
- The decision to build the dam was taken after much deliberation lasting many years. Now, nobody, howsoever eminent and respected, has any right to reopen the issue. A delay of even a single day means a huge expense (Rs. 4 Crores) to the public exchequer in Gujarat.
- While they are willing to talk to the leaders of the anti-dam agitation on issues such as resettlement and deforestation, the question of the government reviewing the project as a whole or of stopping work on the project while such a review was in progress, just did not arise.

The saner elements amongst them (a small minority) also felt that:

- Confrontation between the people of Gujarat and the people of M.P. should be avoided and agreement should be reached through negotiations alone.

Each of the first three points is debatable to say the least. Public support to issues varies with time as the amount of information available to the public changes. Governments are prone to present only one (very rosy) side of the picture while commissioning a project. They are also liable to resort to ambiguity and misinformation so that by the time the project affected people come to realize what is to be their impending fate, it is already too late and the issue has been well and truly settled. In the not too distant past almost everybody including myself thought that nuclear energy was a boon. It is only as more and more information has become available that people have come to realize the unmitigated curse it actually is. To forego the right to reopen and reexamine issues in the light of new information just because the matter has been previously settled and now a large amount of money has already been spent, is not a sign of sanity. It would be somewhat like letting a wrongly condemned innocent serve out his sentence rather than look at fresh evidence establishing his innocence just because originally the victim had been subjected to a 'fair trial'; or to knowingly eat spoilt food because food costs money.

Nobody can deny those who support the dam their democratic right to express their viewpoint through rallies, demonstrations, slogans, etc. In a proper system we would have one rally bringing pressure on the government to stop work on the dam and reconsider while the other rally would pressurize the government to do no such thing. Each would try to convince the public of the rightness of its cause. The ensuing debate would result in an informed public which could then make up its mind. Unfortunately what is happening on the Gujarat - M.P. border is the very negation of the democratic process.

What we have opposing the entry of anti-dam agitationists into Gujarat is not a mere rally of the people, but a rally which is state supported if not actually state sponsored. It is the state which provides commandeered buses to transport the rallyists, most of whom prefer to spend the cold nights in comfort at home. At times, the distinction between the rallyists and the police has been totally obliterated. Thus, what we are witnessing is an attempt by the State aided and abetted by vested industrial and commercial interests to silence its critics by unleashing on them a counter demonstration of larger numbers. It is besides the point that as days pass these large numbers have found it difficult to match the determination and staying power of those whose very survival is at stake. Even the police has found the place too cold for comfort.

Many credit the Gujarat Chief Minister, Shri Chimanbhai Patel as the mastermind behind this strategy of pitting one demonstration against another. The manipulative skills of Shri Patel are no less renowned than those of Shakuni Mama in Mahabharat. But it is not the amorality of Chimanbhai which is of importance. It is those who have willingly lent themselves to be his instruments who need to reconsider their actions. If this attempt to silence dissent succeeds, then the way would be open for all administrators to resort to rent-a-crowd techniques to crush dissent on any issue whatever, be it environment, communalism, or corruption in the state machinery. In fact, there already has been a great proliferation of fascist methods all over the land. 117 journalists have been killed in Punjab by people who have banned other journalists from calling them 'terrorists'. The attempt to gag *'India Today'* is wellknown. Not so wellknown is the attack on the office of a small bimonthly publication *The Voice of the People* Awakening in Bombay for daring to write an article critical of BJP. Recently a group of Sarvodaya leaders who were peacefully fasting and praying for the restoration of communal harmony in Ayodhya, were badly beaten up by hoodlums belonging to the Bajarang Dal who were proud of the fact that they belonged to the 'Godse' tradition. The police in this case intervened by arresting the peaceful demonstrators instead of taking any action against those in flagrant violation of the law, because to even touch these 'sacred bulls' in Ayodhya today is to invite disaster upon oneself. But whether out of cowardice or out of collusion, the fact remains that the State today is a participant in the attempt to subvert the freedom of expression.

Mahabharat is a recurring theme in our culture. It is a tale which can be and has been viewed at many levels and which furnishes many morals. A quarrel between brothers which ultimately led to universal destruction. A war which became inevitable because decent and respectable men decided that standing up against injustice was not necessary and discretion was politic. A fight of right against might in which both sides sometimes indulged in morally indefensible actions but in which Dharma ultimately triumphed against seemingly invincible state power.

Just as we go to the press, distressingly late as usual comes the very welcome news that Medha Patkar and her colleagues have given up their twenty two days fast and the agitation is to enter a different phase. We applaud the realisation that the environmental movement in India needs life not death. Some may consider this retreat, a defeat. 1 don't. Mahabharat was not won or lost at Kurukshetra. It was a battle in the field of Dharma, where only Dharma could be victorius.

Surendra Gadekar

Last year, Argentine President Carlos Menem announced that a nuclear waste dump planned near the village of Gastre in the region of Patagonia, was to be abandoned, or "frozen", at least until the year 2040. Yet at least 70 people are presently working at Argentina's National Commission for Nuclear Energy on the project Another 50 people are at work on the same project at the National University of Cuyo. The planned dump has been opposed for a number of years by activists and communities in both Argentina and Chile. Now, the plan is receiving support from France. When Juan Schroeder, an anti-nuclear campaigner denounced the French connection, he and later his family, began receiving death threats. What Schroeder was objecting to were plans by the French Government to export nuclear wastes to Argentina. Despite Menem's declaration, the decree which established the project has never been revoked. The manager of the project said in a public debate "the work for the dump site proceeds normally."

The Sterilized Zone (Part II)

We continue our series on Nuclear Off site Emergency Response Plans. In our last issue, we had briefly focused on guiding principles, types of accidents, radiation hazards, and given a bare outline of the protective measures envisaged and defined the concept of emergency zones. We shall consider different protective measures in detail in future issues. In the following we focus further on general principles.

Underlying Principles

The principles which govern the planning of protective measures in the event of radiation accidents are based on the following :

In the event of an accident, protective measures may need to be implemented to limit the radiation exposure of the members of the public. However, the implementation of these protective measures can involve social cost, risk inconvenience and hardship to those involved. Therefore, any protective measure should be introduced only if the from further exposure to radiation would be greater than the detriment to the health and social life that would result from the protective measure itself.

The concern for risk, inconvenience, and hardship caused to the public is indeed touching and very commendable. But would not this concern be far more appropriate if shown during the site selection process itself. The risk imposed on the public even during the routine operation of the plant, let alone during an accident, is quite considerable and totally Involuntary. The people near a nuclear plant accept the risks imposed by the plant only because they are ignorant of them.

Secondly, who decides which risk is greater: whether from further radiation or from implementation of the protective measures? In the nucleocrats' scheme of things, the answer is obvious: officials decide. They have the knowledge, they have the information, they have the scientific detachment and 'objectivity': the public on the other hand is ignorant and is incapable of understanding such 'technical' issues. The fact that the officials also have vested interest in keeping the nuclear enterprise going and in minimizing its problems and risks, is besides the point. Also irrelevant is the fact that the officials who make the decisions between different levels of risk are not the ones who are incurring the risks themselves but the guys sitting In Bombay. But then that is what objectivity is all about! (See discussion on Intervention Levels)

Risk from stochastic effects should be limited by introducing protective measures so as to achieve a net positive benefit to the individual. Examples of stochastic effects are cancers, genetic mutations, etc., for which there is no minimum radiation dose or threshold for initiation. These effects cannot be predicted for any specific individual but can only be estimated as an increase in their probability of occurrence in proportion to the dose among the exposed population.

Serious non-stochastic effects should be avoided by introduction of protective measures to limit individual exposures below the threshold value for these effects. Examples of non-stochastic effects

PROBABLE EFFECTS OF ACUTE WHOLE BODY DOSES

Dose in rems	**Probable** Effects
0 — 25	No detectable clinical effects. Probably no delayed effects.
25 — 100	Slight blood changes with later recovery. Possible nausea. Delayed effects possible but serious effects improbable.
100 — 200	Nausea and fatigue, possible vomitting. Reduction in certain blood cell counts with delayed recovery.
200 — 300	Nausea and vomitting on the first day. Two week latent period followed by general malaise, loss of apetite, diarrhoea, moderate emaciation. Possible death in two to six weeks; for most healthy individuals recovery likely.
300 — 600	Nausea, vomitting, diarrhoea in the first few hours. Short latent period followed by epilation (loss of hair), loss of apetite, general malaise, then haemorrhage, emaciation, purpura (an eruption of small purple spots of the skin), diarrhoea, inflammation of the throat. Some deaths in the first weeks. Eventual deaths to about half the individuals at about 450 rems.
1 600 and more	Nausea, vomitting, diarrhoea in the first few hours. Short latent period followed by diarrhoea, haemorrhage, purpura, inflammation of the throat, fever by

are skin reddening, epilation, (falling of hair), changes in blood chemistry, vomiting, etc. for each of which to occur there is a definite threshold radiation dose value.

This table of probable effects of acute whole body doses, Illustrates the nuclear mindset as nothing else can. The whole attitude which permeates the nuclear effort Is right there In black and white— Up to 100 rems: "delayed effects possible but serious effects Improbable" — this from the same guys who Just a few lines previously write, "stochastic effects are cancers, genetic mutations, etc. for which there is no minimum dose or threshold for initiation." Let us consider the delayed effects If Just a 1,000 people each get this dose. According to the latest report of the U.S.Committee on Biological Effects of Ionizing Radiation (BEIR-V) — the nucleocrats' own bible — this much dosage would result in anywhere between 8.6 and 42 persons getting fatal cancer. This itself Is an enormous number, hundreds of times larger than 'normal' Incidence. However, many Independent scientists consider this estimate too low. (Over the years, the BEIR committee has a record of periodically revising their probable cancer numbers upwards). Dr Goffman's calculations show that it would be more like 266 which is more than one fourth of the population irradiated. But to Indian nucleocrats these fatal cancers are nothing "serious." What they demand as proof of hazard are dead bodies littering the streets, as in Bhopal. Alas, Bhopal has shown that even that horror is perfectly acceptable — since there is "net benefit to the individual."

High acute doses of radiation cause immediate problems. (See Table on previous page). These symptoms are a cause of worry not only to the poor afflicted patients but also to public—relations conscious nucleocrats. Therefore, the philosophy is, use protective measures to try and keep individual doses below the threshold where Injury becomes quickly apparent. As far as other effects such as cancers and genetic abnormalities are concerned, they take a long time to manifest themselves and therefore the risk of introducing the protective measures can safely be balanced against the risk of producing cancer later, so as to "achieve a net positive benefit to the individual." However, unfortunately, these cancers are not Imaginary — they do occur and to those who get them tills *talk of "net benefit" is a cruel Joke.*

Intervention Levels

Intervention levels serve as aids in planning and decision making during an emergency. Expressed in terms of projected radiation doses, they provide guidance on the need to take specific protective measures, such as evacuation, sheltering, thyroid blocking and banning consumption of affected foods. Intervention levels are laid down as a lower and an upper level. Below the lower level, the protective measure would not normally be justified. At or above this level the measure is recommended for implementation unless valid reasons exist for deferring action. At or above the higher level, the measure is mandatory unless implementation entails demonstrably greater risks for the people involved.

Intervention levels also illustrate the Indian nuclear mindset admirably. For one thing, they are amongst the highest in the world. For example Britain recommends a lower level of 0.3 rem for sheltering while it is 1 rem in India. But the most dangerous level here is the lower level recommended for banning food consumption. One rem per year for the general population is Just way too high. If food contaminated to this level were to be eaten by the whole population of the country, it could result in anywhere up to two million cases of new cancers every year. Since this is the lower level, nucleocrats consider action banning food consumption at less than this level as inappropriate. The mandatory upper level of five rems a year Is Just out of this world. (May be nucleocrats are actually secret population control agents). For comparisons sake, the recommended public radiation exposure level in the US (where too the same breed rule the roost but public conciousness is somewhat greater) is one tenth of a rem.

Intervention Levels for Radiation Exposure

Protective Measure	Lower Level in rems		Upper Level in rems	
	Wholebody	Thyroid	Wholebody	Thyroid
Sheltering	1	–	5	–
Sheltering and Thyroid Blocking	1	2	5	**10**
Evacuation	2	20	10	**100**
*** Banning food** consumption	1	10	5	**50**

*** : Consumption** of contaminated food would deliver **this** dose **in** one **year.**

The Cancer Controversy

Since gamma or penetrating radiation is a normal constituent of the atmosphere, repeated exposure to a small dose of ionizing radiation is an inescapable condition of life on this planet. There are several reasons to believe that these inevitable exposures could cause cancers and birth defects.

But it has also been argued that background radiation is a benign influence which provides essential stimuli to the immune system. With universal exposure to this more or less constant dose of background radiation, and no alternative sources of radioactivity, it might have remained impossible to refute this optimistic view. However, man-made sources of radioactivity should make it possible for epidemiologists to arrive at the correct conclusion.

Studies of the health effects of very small doses of radiation face three design problems: how to accurately measure the radiation doses large numbers of persons have received (the dosimetry problem), how to prevent comparisons between exposed and unexposed groups from being bedeviled by other differences (the selection problem), and how to cope with the varying lengths of cancer latency (the follow-up problem). These technical problems lie at the center of the debate about the cancer effects of low-level radiation, and the cancer issue is central to the controversy about nuclear technology. Therefore, it is important to appreciate the strengths and the weaknesses of the more important surveys of radiation effects that have been conducted. These include a mortality study of the Japanese atom bomb survivors, carried out by the Radiation Effects Research Foundation (RERF data), a similar study of workers in the nuclear weapons industry (Hanford data), and the Oxford Survey of Childhood Cancers (OSCC data).

RERF data

This ongoing survey began five years after the bombing of Hiroshima and Nagasaki and is still keeping tabs on 80,000 survivors. It is estimated that several members of this study population received a very high (over 100 rad) dose of gamma radiation. But two thirds of the group are believed to have received under 10 rad, which is less than the usual lifetime dose from natural background radiation.

Over the years there have been many comparisons of the mortality rate of these survivors and of other Japanese citizens born at the same time (external or exposed / unexposed comparisons), and also between groups of survivors who experienced different dose levels (internal or graded-dose comparisons). The results of this work have always been the same: cancer deaths have always appeared to occur in direct proportion to the estimated dose received; and for other causes of death there has always been an impression that no significant differences existed between groups of exposed and unexposed persons or between groups of survivors who received low and high doses.

On the strength of these observations, RERF investigators long ago decided that the only late effect of radiation was cancer. In other respects there were no material differences between A-bomb survivors and their Japanese contemporaries. For this reason, the safety recommendations of the International Commission on Radiological Protection (ICRP) and the World Health Organization (WHO), and all the cancer risk estimates contained in the latest report of the U.S. Committee on Biological Effects of Ionizing Radiation (BEIR V) are based on the following assumptions: If a population if exposed to ionizing radiation (excluding prenatal exposures), there will be no late effects apart from cancer, and the risk of any individual developing cancer, will be directly proportional to the dose received (straight line or linear dose relationship). There is also general agreement that RERF data are probably the most reliable source of cancer risk estimates for occupational exposures and other low-dose situations, although there is no reason why the findings of other high-dose studies, such as the British ankylosing spondylitis study of late effects of radiotherapy (refereeing to a rare disease involving spinal fusion), should not be used to supplement RERF data.

Despite the general consensus, one has only to consider the appalling state of Hiroshima and Nagasaki in the autumn of 1945 and the following winter to realize that a number of questions have been left unanswered. For example how could thousands of injuries from the blast as well as radiation have had no effect on the makeup of a population of five-year survivors? Would survivors of such injuries (to say nothing of general devastation) not have had stronger constitutions than non-survivors? Finally, why have there been no tests of a relatively simple theory, namely, that, at high dose levels, in addition to cancer, there may be other harmful effects of radiation, such as immune system damage, which were counter-balanced statistically by the "beneficial" effects of the early deaths, that is the selective survival of exceptionally fit persons?

With only one bomb in each city, any selection effects of the early deaths would be as strongly dose related as any late effects of radiation. Therefore a balancing act between contrasting effects of selection and damage to the immune system could easily leave a false impression that neither effect had occurred.

In 1978 RERF scientists looked for and failed to find, any signs of selection. But ten years later, when RERF released a data tape relating to deaths from 1950 to 1982, George Kneale and 1 had the opportunity to do what should have been done much earlier—namely, to apply to non-cancer deaths a statistical test of *simultaneous* effects of beneficial and harmful influences.

Such a test was not difficult. When applied to 24,461 non-cancer deaths it produced evidence of two opposing effects which were dose related but not exactly balanced. Below 100 rad a beneficial effect was in ascendancy, but above this level it was clearly the weaker of the two effects. When deaths from heart attacks and strokes were excluded, it was possible to see that the remaining deaths, including all deaths from infections, were most affected by the two contrasting influences.

There is, as yet, no sign that this independent analysis of RERF data will influence official recommendations concerning radiation exposures. If, however, we are correct in assuming that the beneficial effect is selection, and that the harmful effect is immune system damage, there should certainly be changes. For example, the lasting selective effect of the early deaths would make it necessary to revise opinions about the general validity of RERF data, and a lasting effect of immune system damage would make it necessary to revise opinions about the best method of estimating cancer risk. The method currently approved by ICRP and other authorities, "linear extrapolation of high-dose effects," merely requires applying a straight line or linear dose equation to cancer deaths of A-bomb survivors or radiotherapy patients. But if cancer is not the only late effect of exposure to high levels of radiation, the current risk estimates for low doses should be replaced with estimates based on the cancer experience of nuclear workers.

Hanford data

One of the oldest and largest of several U.S. centers for research and development of nuclear weapons is Hanford Nuclear Reservation in Washington State, where the main activity, since 1943 has been the large scale production of weapons-grade plutonium. The employment records of Hanford workers indicate their annual doses of external radiation, initial job title and subsequent changes, results for all tests for internal radiation (which are known collectively as bioassay data),and the results of tracing cause of death through social security death benefit claims. These data have been examined by two rival groups of epidemiologists. Thomas Mancuso, George Kneale and I (MSK) examined these records in 1977, but were later replaced by scientists from the Battelle Pacific Northwest laboratory (PNL).

We found a detectable cancer risk at supposedly safe dose levels, well below the maximum permissible dose for external radiation, five rad per annum. According to PNL, this is not so, and one sign that "all is well" is that Hanford workers have a lower cancer death rate than the expected rate for all U.S. citizens of comparable age.

The MSK argument is as follows: The low cancer death rate is merely the result of the fact that sickly persons were excluded from employment at Hanford. This so-called healthy-worker effect is typical of all well-paid industries, and may be different for workers in the same industry doing different types of work.

Inspections of Hanford job titles revealed so many changes (presumably avoid exposures above the maximum permitted dose), and so many meaningless titles (presumably to meet secrecy requirements), that we decided to equate danger levels of work at Hanford with the frequency and the results of bioassay (internal radiation) tests. This decision was followed by a statistical analysis of the effects of *external* radiation, with and without controlling for danger levels. With this control, there was a definite evidence of a cancer risk, and without it the evidence "disappeared."

PNL, who recognized four groups of "main occupation" and ignored frequent job title changes, argued that the MSK use of the bioassay data produced "an artificial bias towards a positive correlation of radiation exposure and mortality." This criticism might be relevant if MSK had categorized workers according to the sum of all their bioassay tests, but in fact we assigned workers *annual* positions on the danger scale. PNL has now conceded that, even without the MSK type of control, there is evidence of a radiation effect for one type of cancer (multiple myelomatosis), a disease of the bone marrow, which "has persisted with additional follow up."

The dispute persists regarding interpretation of Hanford data, which for our part is based on records up to 1977. On July 17, 1990 however, the U.S. Department of Energy released all records of Hanford workers to 1981, which my colleagues and I will examine over the coming months. This is only the first batch of records, which will eventually include follow-up to the present date of workers at all important Department of Energy facilities.

Nothing of much value has thus far come from other studies of nuclear workers, which have had shorter follow-up periods and/or involved smaller numbers. As a contribution to the low-level radiation and cancer controversy, the Hanford studies to date clearly rate very low. But in conjunction with other studies of nuclear workers they hold out the promise of a final resolution of the question by the end of the century.

OSCC data

The first evidence of any cancer effects of low-level radiation came from comparing the medical records of children who died from leukemia or other forms of cancer in Britain (cancer cases) with those of healthy children from the same regions (live controls).These comparisons showed that members of the group who developed cancer had been X-rayed before birth twice as often as members of the control group.

This crucial finding of the Oxford survey dates back to 1956. Similar studies of cancer deaths have continued in later years. The later work not only confirmed the original X-ray findings but also showed that all childhood cancers have *in utero* origins. Eventually, with national coverage of all cancer deaths of children under 16 years of age from 1953 to 1980 (22,531 cases), and with independent measurements of the background radiation for each 10-kilometer square of the country (there is considerable variation in the terrestrial component of these doses), it became possible to assess the potential cancer effects of background radiation. Seizing this opportunity, the Oxford survey showed that prenatal exposure to background radiation is an important cause of childhood cancer and is possibly the *only important* cause; for more than half the OSCC cases, these early exposures were the apparent cause.

There were several reasons why the Oxford survey group could complete such a difficult task. By interviewing mothers, including those of control subjects, it was possible to assemble a wide range of case and control records from several places including prenatal clinics, hospitals, and X-ray departments. Also, the Oxford survey had records of climate and population density, as well as annual numbers of live births, stillbirths, and infant deaths for over a thousand local authority regions. With such voluminous data it was possible to recognize events which had a direct effect on cancers, such as post-natal X-rays (harmful effect) and inoculations against infections (beneficial effect), as well as events which made it difficult to recognize the true frequency of childhood cancers because they operated as "competing causes of death." Competing causes included stillbirths, infant deaths, and infection deaths of older children — which were found to have an exceptionally strong association with leukemia. By steering a straight course between a host of confounding variables, the Oxford survey detected the effects of natural background radiation and showed that it was harmful in the same way that pre-natal X-rays are harmful; that is by causing cancer mutations.

Conclusions

Both the bombing of Hiroshima and Nagasaki in 1945 and the use of radiotherapy made it inevitable that studies of A-bomb survivors and hospital patients would take precedence over studies of nuclear workers. Ideas about possible effects of natural background radiation were bound to be coloured by what is known today as RERF data and the ankylosing spondylitis survey.

According to these sources, it would be safe to assume there are no late effects of radiation apart from cancer, no lasting selective effects of early deaths of A-bomb victims, and no cancer risk at low dose levels (below 20 rad). At the same time, a rapidly expanding nuclear industry successfully avoided the troubles with afflicted radium luminizers in the 1930s simply by obeying a rule that workers receive no more than five rad per annum. The nuclear establishment had good reason to believe that a potentially dangerous situation had been completely diffused, and optimists were still free to regard daily exposure to background radiation as a benign influence.

For several years the only indication to the contrary was the Oxford survey's finding on prenatal X-rays. But today we face the possibility that there are other late effects of radiation besides cancer; and the possibility that the selection effects of he two nuclear explosions are still reflected in the death rates among survivors and are the reason why no cancer effects have been found at low dose levels If these possibilities are confirmed, we may one day realize how fortunate it was that the Oxford survey findings put a brake on the enthusiasm of nuclear power advocates. Otherwise we might never have pressed for direct studies of the effects of low doses of radiation.

Source: Alice M. *Stewart*
Bulletin of Atomic Scientists September 1990

Editor's Note: There are a number of references to this article which are available in the *Bulletin*

Voices of Warning

The Greek legend of Cassandra, the princess whose gift of prophesy was unfailingly accurate but never believed, was no doubt a story born in reaction to the earlier destruction of much of the Aegean ecology by the Mycenaean civilization in the centuries before 1000 BC. That destruction was so widespread and devastating — the forests that once covered the Mediterranean coast were **cut down,hills opened to erosion, grasslands made into deserts by spreading herds — that it lead to the collapse and obliteration of Mycenaean culture and subsequent Greek 'dark ages'. Some voices, surely, there must have been crying out against that destruction, warning of the consequences if foresters continued to cut the trees and the herders to unleash their flocks, promising that civilization** itself would come to an end — and yet, just as surely,they were ignored, probably scorned and derided. The memory of all this most likely led the later Greeks to imagine such a seer as Cassandra and device the myth of her futile prophecies.

And so today, the signs are all around us, the evidence apparently incontrovertible, the voices raised in warning. And yet like the Mycenaeans — and the Romans, the Sumerians, the Mayans, the Harappans, the Tang Chinese, and others — the rulers of this civilization refuse to hear, refuse to change.

Those of us who are Cassandras by profession and inclination might be moved to despair: at times it seems so illogical to speak what to gods have determined will be ignored. Yet, what else can one do?

I am moved to these thoughts by the latest bit of cassandraic evidence to cross my desk. According to the largest and the most comprehensive recent reports of cancer deaths in industrialized nations — published in *The Lancet,* August 25, 1990, written by an American professor, the director of the UK census office, and the director of the World Health Organization's statistics office — the rates have been soaring alarmingly. Between 1968 and 1988, rates of brain cancer and bone-marrow cancer in people over 65 increased by 50 to 600 per cent, depending upon the industrialized country selected, and kidney cancer, breast cancer and lymphoma by 10 to 50 per cent. Overall cancer mortality, high enough to begin with in the sixties, has immensely magnified in just twenty years.

These are deaths in industrialized countries —7 the US, Japan, UK, and three other European nations — and it is industrialization that has caused them. Epidemiologists are agreed that environmental factors, particularly air pollution and toxic waste in ground and water, and dietary regimens, are the culprits.

And no, it is *not* a matter of better reporting or diagnosis of disease,nor of old people simply living longer. Those factors were considered and discarded in this study, with the conclusion that the increased mortality — the sharply, startlingly increased mortality, I might say —. is simply the result of the way Western civilization has chosen to evolve.

And does such news make the front pages, prompting cries of anguish and alarm from officials in charge of our health, from activists eager to protect citizen victims? Hardly. The report appeared in *The New York Times* on page 18, effectively buried, and it was accompanied by business-as-usual disclaimers from medical and governmental officials. "The statistics here are well known," said the yo-yo who is the deputy director of the division of cancer prevention at the National Cancer Institute outside Washington. "I don't think it is telling us anything really new."

Well, if it's so bloody well known, why don't more people know it? And if it's nothing new, why hasn't something been done about it?

Cancer is the very clearest early warning device that this civilization has. It is as indisputable as death, as sharp as pain. If death rates are going up, on average, more than 300 per cent over the last twenty years, this is a horrible indictment of the way industrial society lives — and does.

And yet the message, for all its clarity, is ignored. Cassandra will not be heard.

Kirkpatrik Sale
Resurgence No 143 November/December 1990

When pollution levels in Copehagen , mark. rise above the World Organisations' standard, Friends of the Earth's anti—smog network swings into action human chains block traffic on main roads for several minutes during the rush hour. have had to bear some heavy fines blocking traffic, but together with a coalition of trade unionists, cyclists and senior citizens, they're determined to win an alternative traffic plan for the city. The plan includes percent cut in traffic, a light rail line, a better bus service and improved bicycle access.

A Tale of Two Superpowers

Many 'defense' analysts including Gen Sunderjee and Jasjit Singh have recently been arguing that India should "exercise its nuclear option." In plain words, openly declare its intention to make nuclear weapons and then proceed to make and test them along with their delivery systems. This is supposed to lye a cost-cutting measure! Right now, we are not going into the merits of this thesis, but merely present a short account of the human cost to the bomb-makers themselves of the very first bomb making efforts at Hanford in U.S.A.,and Chelyabinsk in the Soviet Union. The portion regarding U.S efforts appears as an editorial by Len Ackland in the September 1990 issue of Bulletin of Atomic Scientists We would strongly recommend activists to read this issue of the Bulletin in depth since it is specifically devoted to the health effects of low-level radiation. The material on the Soviet Union has been prepared by Thomas Cochran and Robert Norris and published as a paper in a series called Nuclear Weapons Databook.

Human Guinea Pigs

Tom Bailie, a farmer born in 1947 near the Hanford nuclear weapons production complex, has long believed that his thyroid disease and sterility as well as the cancer affecting relatives and neighbours were caused by the radiation emissions from the complex. "I'm not antinuclear, " he said, "but what they did to us was industrial recklessness and stupidity."

"They" were a large, if undefined, number of US government officials, scientists and contract employees who ordered or knew about the regular releases of dangerous radiation byproducts, including radioactive iodine, from Hanford. These emissions were measured by the government, but kept secret for decades from Bailie and some 270,000 other residents of a 10-county area around Hanford. Finally, under pressure from local public interest groups (mainly Hanford Education and Action League (HEAL) — a group with whom *Anumukti* has an exchange arrangement) which filed Freedom of Information Act requests, the US Energy Department in 1986 declassified and released documents about Hanford's emissions. But the government refused to acknowledge that the radiation could have caused illness.

That policy of denial abruptly changed on July 11, 1990 when US Energy Secretary James Watkins admitted at a news conference that some residents in the Pacific Northwest US had received high radiation doses to the thyroid. Not Coincidentally, Watkins's rather generalized announcement preceded by a day the release of a two -year Energy Department financed study by an 18-member panel of scientists and other citizens. It disclosed that 13,700 persons — 5% of the 10-county population, — had on the average each absorbed a radiation dose of 33 rad (equivalent of about 1650 chest X-rays) from late 1944 to 1947 and that an undetermined number of children might have received doses as high as 2,900 rads to their thyroids.

"We learned several years ago that the Government decided —with cold deliberation— to use us as guinea pigs by releasing radioactivity into our air, water, milk and food without our consent," Bailie wrote in *The New York Times* after the recent revelations. "Now, we've learnt that we can expect continuing cancer cases from our exposure in their 'experiment.' Is this what it feels like to be raped?"

Bailie feels abused and betrayed by his government. "Moscow was condemned for its three days silence after the Chernobyl nuclear accident. What about Washington's 40 years of silence?"

The question should resonate across USA. Tom Bailie didn't volunteer for a hazardous Cold War waged in part by the large scale production and testing of nuclear weapons. Even if his family, and the hundreds of thousands of other families living around the nations nuclear plants and the Nevada Test Site, had volunteered, they should have been fully informed of the risks. As new information became available, it should have been passed along. Such a civilized procedure should have also been followed with the estimated 600,000 to 1,000,000 men and women who worked in the U.S. nuclear weapons plants from World War II to the present. Instead, secrecy was the rule, "national security" the justification.

At the very least, society owes all of these people, these victims and potential victims of the Cold War, a thorough accounting of the health risks they incurred from radiation exposure and medical care for those who need it. Most of their exposure involves relatively low-level radiation, a phenomenon which is causing considerable controversy with regard to nuclear power plants, nuclear waste and other sources of radioactivity.

The Most Contaminated Spot on Earth

In early 1942, the possibility of an atomic bomb became a serious issue for the Soviet leadership. In the university library at Vornezeh, Flerov noticed that articles on nuclear fission were no longer being published in the West, a sign to him that secret work was under way. In May, Flerov wrote to Stalin that "we must build the uranium bomb without delay."

By the time of the Potsdam Conference, in July 1945, the Soviet Union had a serious atomic bomb project underway. After one conference session, Truman casually mentioned to Stalin that U.S.A. had a "new weapon of unusual destructive force." Stalin told Truman he hoped the U.S.A. would make "good use of it against the Japanese." He also ordered his scientists " to provide us with atomic weapons in the shortest possible time." One day after Hiroshima, Stalin put his secret police chief, Lavrenti P. Beria in charge of the Soviet version of the Manhattan Project. The first Soviet atomic bomb was assembled at Chelyabinsk and tested on August 29, 1949.

The Soviet Union followed a pattern of nuclear weapons materials production similar to that followed by U.S.A. Each began with construction of natural-uranium fueled, graphite moderated, reactors for plutonium production and development of gaseous diffusion technology for the enrichment of uranium. Today, the Soviet Union relies on both graphite and heavy water moderated reactors for plutonium and tritium production. The government announced in 1989 that it was ceasing the production of highly enriched uranium.

Production Sites

Soviet plutonium and tritium production for weapons takes place at three locations:

Chelyabinsk-40, near Kyshtym in the Urals, at Siberian Atomic Power Station near Tomsk and on the Yenisey River, 10 km north of Dodonovo in Siberia. Prior to 1987, there were as many as 14 production reactors at these sites — six at Kyshtym, five at Tomsk and three at Dodonovo. Between 1987 and August 21, 1990 four of the production reactors at Kyshtym and one at Tomsk were closed down. The fifth reactor at Kyshtym was scheduled for closure in October 1990. In October 1989, the Soviet Union announced that it intends to cease plutonium production by the year 2000.

The Kyshtym Complex

Called by its post office box address, Chelyabinsk40 is not marked on maps of the Soviet Union. It is about 15 km east of the city of Kyshtym on the east side of the southern Urals in Chelyabinsk province. It is located in the area around Lake Kyzyltash, in the upper Techa River drainage . basin among numerous other lakes with interconnecting watercourses. Probably fashioned after U.S. Hanford reservation, it was constructed in 1945-46 reportedly using the labour of approximately 70,000 inmates of labour camps. Spread over 90 square kilometers, it employs some 10,000 people. Its population including dependents is variously estimated to be between 83,000 to 100,000.

Radiation Exposure to Workers

The period 1948—1952 is characterized by exceedingly high exposures. At A—Reactor the *average* annual worker dose peaked at 93.6 rem in 1949, the first full year of operation: and at the chemical separation plant the annual average dose peaked at 113.3 rem in 1951. From 1949 to 1951, 0.5 per cent to 1.8 per cent of the workers were receiving more than 400 rerns annually, which is 80 times the current occupational exposure standard (and considered by many to be way too high!)

Waste Management Activities

Radioactive waste from chemical separation plant at Chelyabinsk is now converted into, special glass, placed in stainless steel containers, and stored in cans in a special storage facility at the site. This, however, was not always the case. In fact, during the early years radioactive waste management was nonexistent.

According to the official report, "During the first five years of the operation of the enterprise in this branch of industry there was no experience of scientific development of questions of protecting the health of the people or the environment. Therefore, during the fifties there was pollution of individual parts of the territory and around the enterprise." These bland words actually mean that from its beginning in 1948 through September 1951 all radioactive waste was discharged directly into the Techa river.

In 1951, after radioactivity was detected as far away as the Arctic Ocean (more than 1,000 km from Chelyabinsk) a new solution was adopted. The wastes were dumped into Karachay Lake which has no outlet. The Techa river and all its floodlands (8,000 hectares) were excluded from use by people. The Karachay Lake is a 45 hectare natural lake or (bog). It eventually accumulated 120 million curies(MCi) of long lived radionuclides cesium-137 and strontium-90. For comoarison this is about 100 times the amount of these radionuclides released by the Chernobyl disaster. In the 1960s it was discovered that radioactivity from the lake was entering the ground water. Efforts to eliminate the reseivoir began in 1967.

"It's hard to imagine what we could do with nuclear weapons to their [the Soviet] economy that they haven't already done to it themselves."
U.S. Congressman Les Aspin

The area of the lake has shrunk to 25 hectares. Today, radioactivity in the ground water has migrated two to three kilometers from the lake. On the lake shore the radiation exposure is about 600 rems per hour enough to kill a person within one hour. In 1967, a hot summer followed by a dry winter. The water evaporated and dust from the lake bed was blown over a vast area, up to 75 km long,affecting 41,000 people. The lake is now slowly being filled with hollow concrete blocks, rock and soil to reduce the dispersion of radioactivity.

Waste Explosion in 1957

During the initial period of operation of the chemical separation plant the irradiated fuel rods were treated by an all acetate precipitation scheme. After the fuel had been dissolved in nitric acid, and the uranium and plutonium had been extracted, radioactive solutions were formed which contained as much as 100 grammes per litre of sodium nitrate and 80gms/l of sodium acetate. The solution was stored for a year in tanks in order to reduce the radioactivity and cool prior to further treatment for plutonium extraction. After treatment, some portion of the solution was returned to the storage tanks and the less radioactive part dumped into Lake Karachay.

The intermediate storage facility consisted of a rectangular buried concrete canyon with wall 1.5 metres thick designed for holding 20 stainless steel tanks each with a capacity of 300 cubic metres. The tanks were entirely immersed in water and utilized an external cooling system. Some of the instruments for monitoring the tanks failed and could not be repaired due to the very high radiation field in the canyon. As the solution in the tanks evaporated, the tanks rose breaking the seals in the waste transfer lines and contaminating the cooling water. Because of insufficient production capacity the tanks were switched to "periodic cooling mode." The cooling system in one of the unmonitored tanks failed however and the wastes began to heat up and dry out. Nitrates and acetates in the waste precipitated, heated up to 350° C and on September 29, 1957 at 4.20 PM local time exploded with a force of nearly 100 tons of TNT. Some 20 million curies of radioactivity were released to the atmosphere. The largest nuclear disaster previous to Chernobyl.

About 90% of the radioactivity fell in the immediate vicinity of the vessel. Radiation levels within 100 metres of the crater were 400 rems per hour: at 3 km the levels were 3 rems per hour. In a twenty square km area of extreme contamination all the pine trees perished within a year.

There were 217 towns and villages with a combined population of 270,000 who were significantly contaminated. Virtually all water sources were contaminated.

The Situation Today

At some unspecified date, waste storage was shifted to double walled, stainless steel tanks, which have leaked on occasion but have undergone repairs. Concentration and immobilization of high level waste into glass blocks is being carried out. After 30 to 40 years of air cooling, the Soviets plan to bury the waste in granite or salt formation. The government has been looking in the region of the Urals for a possible burial site, but has been facing public opposition.

The Techa River is cordoned off with a wire fence and people are forbidden to catch fish, pick mushrooms or berries or cut the hay. There are 450 billion cubic metres of radioactive water in open reservoirs. Fish in Reservoir No. 10 are reported to be "100 times more radioactive than normal.

As the Soviet weapon's production winds down a new environmental threat has arisen in Chelyabinsk. The massive production complex with its six reactors used to utilize contaminated water from the lakes, thus regulating the water level. With five of the six reactors now closed, the reservoirs might overflow with natural water and possibly even cause failure of dams, sending contaminated water into the rivers of the Ob basin. To counter this threat (among other more 'cogent' reasons), the authorities have proposed a new South Urals Nuclear Power Complex. Work on two large fast breeder reactors began in 1984 But since 1987 construction is at a standstill, firstly because there is no money and secondly due to public protest.

Editor's Note:

We have previously published in Anumukti. various articles and a poem (see last issue) which describe the agony and the betrayal felt by the Hanford downwinders, as well as the horror of Kyshtym. The reason for this repetitiousness is that Hanford and Chelyabinsk are not something that happened 40 years ago in another country. They are happening today in ours. The nuclear mindset makes them inevitable. The question that needs to be posed to defense strategists is: Who are you trying to defend with the bomb? Is it the people? Is it the land? Both get contaminated in the very process of making the bomb. One kills one's own.

LETTER box

Sanctuary is a bimonthly publication which focuses of wildlife and ecology related issues and publishes some dazzlingly beautiful photographs,along with very informative articles. Sometime back I was pleasantly mystefied to receive a spate of letters all carrying the same message pledging opposition to nuclear power and a readiness to disseminate information on the subject within one's community. The mystery was resolved when I received a copy of Sanctuary along with a letter from its editor Bittu Sahgal. The crux of the matter was the response to the deadly disinformation campaign launched by the Nuclear Power Corporation (NPC), through a series of advertisements which have appeared very widely in various publications including Sanctuary. Some readers had strongly objected to this. Below we reproduce a sample of their protest.

Having known *Sanctuary* to be a truly concerned magazine, I was rather dismayed to find an advertisement of the Nuclear Power Corporation glorifying nuclear energy as a safe technology. The presence of this advertisement is particularly ironic in the view that the report "Goa could go" was also printed in the same issue. Are you so hard up for advertisements that this kind of misleading propaganda should be accepted? 1 would prefer to believe that this was a slip up on your part.

S.Lakshmanan
New Delhi

It seems incompatible with the purpose and interests of *Sanctuary* to use advertisements from corporations such as Nuclear Power Corporation. For too long we have stripped our environment in the name of development of the masses. Such a state of affairs is being perpetrated by the hegemony of a certain power class who control the information banks, and by the ballot gain their power to maintain a bureaucracy as corrupt and selfish as itself. They dupe the masses into believing the the destruction of our nation's natural non-renewable resources, its irreplaceable heritage, is development. I think I will be representing a large section of environment-conscious readership in requesting you in future to refrain from using such advertisements.

Bulu Imam
Hazaribagh

Sanctuary 's *Reply:*

We had initially rejected the idea of carrying the advertisements, but after discussions with other conservationists we felt that the NPC should be allowed to have its say, with the idea of subsequently challenging their claims as we have done elsewhere in this issue. This is the closest we have been able to come to a public debate on the wholly untenable claims of the all powerful nuclear lobby in Bombay. In the case of Sanctuary Magazine this stance was practical, but the essence of such a media blitz must be condemned because very few other newspapers , or magazines would consider devoting equal space to countering the claims of each of advertisements. We would, however, be very grateful for still more responses from readers on the pros and cons of our carrying Nuclear Power Corporation advertisements.

It further announced its intention to utilize the surplus generated from NPC advertisements in the following manner

- Present one year subscription to *Anumukti* to the first 150 persons who shall sign and send a specified statement directly to *Anumukti.* (Please see *Sanctuary* Vol. X No. 5 - Sept/Oct 1990 for the detailed statement.
- Provide secretarial and other infrastructural assistance to help organize citizens of Bombay to demand greater accountability on the issue of public health from the Tarapur Atomic Power Station authorities. (In this connection they have also invited me to go to Bombay in the month of March to give a series of talks to be arranged on the university campus, in vaious public halls and with organizers of NGOs -Editor)
- *Sanctuary* will petition the *Indian Society of Advertisers,* the *Advertising Standards Council* and the *Consumer Protection Societyto* prevail upon the Nuclear Power Corporation to withdraw their campaign immediately and to issue public statements to inform society that it was misled. It will also send appeals to all members of IENS to counter the propaganda unleashed by NPC by publishing articles and statements which highlight the hazards of nuclear power.

Anumukti's *Stand:*

While the offer of 150 subscriptions is like the proverbial life preserver to the drowning man in our precarious financial state, we do not approve of this idea of "using their money to fight with them," for the following reasons:

- Firstly, it is not their money, its ours. We should not allow anyone to squander public money to misinform the public Granted, we are today too weak to stop this criminal waste, but under no circumstances should we be collaborators.

- Should the onus of providing the forum for public debate be on us? Nothing stops or can stop NPC from having its say, but should this say be at the cost of the hard earned credibility of magazines like *Sanctuary.* NPC have huge resources at their command. The government controlled media are at their beck and call. It is not for the lack of an adequate forum that they have fought shy of a public debate. For forty years they did not feel the need to "educate the public." It is only in the post Bhopal-Chernobyl era, with its rising tide of environmental awareness that they have suddenly woken up. But even now their preference is not for a debate, but for stage—managed shows and this massive disinformation media blitz.

- May be a better form of public debate would be to print their advertisement series "Nuclear Power and You" in *Anumukti* without payment in conjunction with another series of ads, "You and Nuclear Power" (to be produced by us); the only condition , being that the same be simultaneously printed in their in-house magazines like *Nuclear India, Nu-Power,* and other such.

Needless to add that we strongly welcome the other suggestions mentioned by *Sanctuary* and do our utmost to cooperate. We would honour the commitment made by *Sanctuary* with regard to the pledges — in fact, we have already placed all those who responded on our mailing list.

REVIEW

DIMONA

THE THIRD TEMPLE ?

The Story Behind the Vanunu Revelation

Mark Gaffney

AMANA BOOKS (1989)
P.O. Box 678, Brattleboro, VT 05301
U.S.A.

The nation of Israel is an enigma. On the one hand it is a state as described in this book:- Unjust, brutal and repressive towards its non-jewish population; belligerent towards its neighbours; uncaring, at times even contemptuous of world opinion; willing to engage in one outrageously criminal act after the other; prepared to carry its obsession with security to an extent that it seems willing to bring nuclear holocaust upon the world; indeed a pariah nation.

But, there is another side to Israel. No other people in history have been as persecuted as the Jews. For more than a millennium, they were the only victims available to the Western Uncivilization. Gandhi correctly described Jews as "the untouchables of the world." After being denied land-ownership for more than two thousand years, the transformation in agriculture that the Jews in Israel have brought about in the last hundred years seems nothing short of miraculous. It is the land where the most innovative and radical ideas have been put into practice; where socialism of the kibbutz is still a living idea: it did not degenerate into the 'New Class' as it did in nations where it was the officially sponsored ideology; a country which is alive and vibrant in its arts and sciences; a place way ahead of almost everybody in solar energy research ...In short, it is indeed, the Promised Land.

Recently, I was talking to an Israeli friend. He was totally opposed to the politicians now in charge of the country. "Politics in Israel is worse than in India The same leaders have mislead for more than 20 years. Yet, he defended their policies with great and what I felt as unnecessary vigour. But he admitted one thing. The moment Israel was ready to use nuclear weapons on anyone, it would lose all moral justification to exist.

Mordechai Vanunu, for eight years a nuclear technician at the Dimona research facility in the Negev desert is presently serving an eighteen year prison sentence. This is his reward for having dared to expose the true state of affairs with regard to nuclear weapons development in Israel. He was kidnapped by Israeli secret service agents from Rome, drugged, trussed like an "african slave", chained to a crate on a cargo ship and brought to Israel. He was reviled in the Israeli press as "the greatest traitor of the 20th Century," a homosexual, an exhibitionist, unbalanced and a general 'loser'. On several occasions even his family members were attacked and humiliated.

This book is not so much a story of Vanunu and how he got access to Israeli nuclear secrets, not even about the secrets themselves. One wishes it were! Alas, despite Vanunu's heroic efforts there are many puzzles still left But rather, it is an extremely well researched book about the policies of nuclear ambiguity that Israel has pursued with total amorality for long. It is therefore, of some special interest to readers in India. For India too — the land of non-violence and satyagraha, is an old adept at playing this game of "keeping the nuclear option open". (So, for that matter, is Pakistan).

The book also contains an extremely interesting appendix — which details the evidence for a low yield atomic blast on September 22, 1979 somewhere in the Indian ocean. It was believed at the time that the event was indeed an atomic explosion carried out jointly by Israel and South Africa, but a later report discounted this explanation.

The book lacks an index and this detracts from its otherwise fine quality. An important contribution to the understanding of the dangerous cauldron that is the Middle East

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An Open Letter

My principal message is in several spheres. The individual; citizen, wherever he lives, has to find a way on the personal level to add his contribution to improve the quality of life on earth, to make everyday life pleasant and more tolerable. Much can be accomplished, starting with what the society offers. If, for example, a person can contribute in the sphere of social equality, by working against discrimination due to race, religion or sex, such a person can earn respect and is worthy of emulation. In my. own case, I wanted to expand awareness the nuclear danger in my own country, Israel, and in the Middle East. And I believe that my action contributed to the security and brotherhood of nations.

I showed by my action that the individual still has power, regardless of the almost unlimited resources of the establishment. Indeed, individual action can be a mighty weapon. Through action the individual can hold the establishment accountable. By means of civil disobedience he can expose the dark machinations of any regime, for the sake of the general welfare. Because governments cannot operate without the cooperation of their citizens, civil disobedience will be discovered by many more people to be the mighty weapon it truly is. An action like mine teaches people to trust their own God-given intelligence. An action like mine demonstrates that people must not blindly follow their leaders on crucial issues involving nuclear weapons. Indeed, if there ever was a case for civil disobedience, it is this.

The nuclear threat is relatively new and has not yet been sufficiently comprehended in the world. Most people are simply unaware of the tremendous volcano under them. Should that volcano erupt, there will be no way back for mankind. It will be the end. And this threat, this holocaust, which hangs over us is all too possible, because of human frailty and error — as was shown by Chernobyl.

In the West, people have grown accustomed to living with the nuclear menace, without realizing the magnitude of the danger, and without conscious awareness of the real possibility that nightmare could actually happen. Not only have the superpowers sanctioned the intolerable presence of large quantities of nuclear weapons, the fact is that many nations in the Third World are following in their footsteps, without regard to the dangers.

To do what I did I had first to overcome many personal obstacles. Most important among these was the exposure of my private life to slander and the sacrifice of all my future plans. 1 had to overcome the force of general public opinion around me, especially of those held up as wise. I also had to overcome the views of intellectuals and experts who worked with me at Dimona. I had to say to them "It is you who are mistaken. It is you who are on the wrong path. On this matter, it is I who know better." And i remain certain that my action was worth the sacrifices I had to make, since I was able to point out - consistent with my own philosophy - what must be done in the name of mankind.

To act as I did undermines the blind confidence in the leaders. We saw an example of this problem of blind trust during Israel's invasion of Lebanon. At that time a majority of Supported the war without doubting it — yet today the situation is exactly reversed. Today most people know that it was not a defensive war — but folly. Today most people know that it was simply a bloodletting to bring about by force the so-called "new order" in Lebanon. Yet because Israelis followed their leaders blindly during that war, many civilians and even children were executed in cold blood. I knew the truth from the war's first day. I knew it was going to be one more example of slaughter. I don't know how I knew, but I did. I simply would not believe the stories and announcements of the Israeli government. Because of those events, I began to take a more critical look at Israel's nuclear programme.

Today I am convinced of the great danger posed by Israel's nuclear policies. Today the government still does not even admit the existence of nuclear arms in the country. They hint at their existence, yet they refuse to allow international inspection of the Dimona reactor. Because the citizenry here is not informed, people are unable to work in a coordinated way to prevent the disaster which may lie ahead. The danger is that in a future crisis, Israel's leaders will be influenced by unreliable information, or will mistake a false threat for a real one, and so will trigger off a nuclear holocaust.

Today nuclear weapons are principally designed for use against civilian populations. A single bomb exploded over a modern city can kill hundreds of thousands of its citizens. Nor does the tragedy end there. Long afterwards, contaminating fallout radiation can make whole regions uninhabitable for many years. In addition, as was demonstrated at Hiroshima and Nagasaki, thousands of people will continue to die from cancer for years after the explosion. Moreover, it must be understood that since Hiroshima the dangers have increased because the destructive power of today's bombs is many times greater. The number of these weapons have reached terrifying levels. It is no wonder the Soviets and the Americans are seeking to eliminate some missiles from the European theater. Yet, from the standpoint of the individual, the best way to effect protection is to study the problem. Only by learning more about the danger can one hope to organize effective prevention.

A society unable to recognize the nuclear danger, a society that fails to take the step[s necessary for survival, is a sick society. Indeed, the best evidence of this fact is the dark cloud, the menace, the warning signs which continue to hang over us. But there are other risks as well. A people that chooses to go on living in daily ignorance of such a threat develops other social and psychological problems which are greatly damaging in and of themselves - without a bomb ever going off. Hence, it is not just the deployment of nuclear weapons, but their very existence, which threatens mankind.

Mordechai Vanunu
Ashkelon Prison, Jerusalem
July 1987

Rhapsodie in Blue

STERILITY PROBLEMS BEDEVIL THE FAST BREEDER

The whole nuclear programme in India is based on a fantastic hope. The fast breeder must work. (Fast breeder reactors are a new kind of reactors which are supposed to produce (breed) more plutonium than the uranium fuel they consume. Fast, refers not to the speed of breeding - which is fairly slow, - but to the speed of neutrons which cause fission). And it must work, not on a tidily little laboratory scale but on large 'commercial' scale. The reason it must, is because our uranium resources are strictly limited. (In fact, but for us and a few other aspiring 'regional powers,' nobody in the rest of the world even looks at such poor quality ores. And even these are getting rapidly exhausted. So, unless the breeder can assure us of 'unlimited' plutonium in the future, all the brave words like self-reliance and energy independence would remain mere words. Now, one might wonder why this bother about self-reliance when we manage very well with foreign collaboration in such esoteric fields as soaps and toothpastes! However, these industries do not produce material that can be used for making nuclear bombs. Fast breeder reactors do. However, the only guys who have built a commercial scale breeder, are the French. Their programme is a colossal financial disaster — but that is another story. The following report, which appeared under the headline: Ailing Nuclear Reactor Beyond Salvage in The Sunday Observer of December 9, 1990, gives details of the technical snags affecting the Fast Breeder Test Reactor (FBTR) situated at Kalpakkam.

India's ambitious fast breeder nuclear programme has come to a grinding halt with the 40 MW fast FBTR becoming permanently unoperational. With this, the plan of setting up a 500 MW fast breeder prototype of the Kalpakkam type reactor has fallen through.

According to the Department of Atomic Energy (DAE) sources, the Kalpakkam FBTR has never been operational except for a few minutes on October 18, 1985 when it produced enough power to light a 200 watt bulb.

Immediately after the much publicized commissioning of the plant, it was shut down. It was then reported that the operating level of the plant would be slightly increased. But now, after five years, that remains a pipe dream.

According to DAE sources, the Kalpakkam FBTR had to be closed down because it was ill-equipped to run at a higher power or for more than those few publicized minutes.

DAE circles further claimed that there were several instances of "one minute criticality" before it completely collapsed. They attribute this to some basic flaws in the design of the reactor. Senior scientists working on the project allege that the design of the entire steam generation unit was done "independently" of the reactor design, and there were crucial variations between the two. The steam generation unit, they alleged, was not built according to given specifications.

To top it all, in the hurry to stay on course with the given goal of generating 10,000 MW through nuclear power by the turn of the century, the reactor was made critical even before the design anomalies were rectified. The result was that the sub-assembly unit of the core of the reactor, called the calandria was damaged. It is yet to be rectified.

In a reactor of this design, the control rods, (called the guide tubes) and fuel rods of enriched uranium are placed alternately. In the FBTR they became intertwined, each obstructing the other's passage, thus rendering the reactor static. This is a unique problem which has no precedent, say DAE sources.

Serious radiation threat to the technicians stands in the way of rectifying the damage. The high radioactivity permits only intermittent access to the reactor and make it extremely difficult to adopt any hands-on approach in solving the problems. Due to premature criticality, even the simplest maintenance tasks are rendered complicated and long drawn out.

A recent proof of this was a circular put up on the notice board at Kalpakkam which congratulated the technicians on successfully disentangling the reactor guide tubes. But contrary to what the circular states, sources in Kalpakkam allege that the guide tubes have not been disentangled and are still within the core of the reactor.

The flaws in the guide tube assembly have stalled the insertion of fuel rods into the reactor core or its removal. This could lead to a serious accident if the reactor was "on power". Compounding the difficulties in undertaking the repairs is the lack of know-how in any part of the world.

In a desperate move to salvage the fast breeder programme, the DAE imported and used parts of the junked French reactor *Rhapsodie,* on which the Indian breeder is modeled. French nuclear experts are of the opinion that the components of *Rhapsodie* - which was primarily a private design decommissioned several years ago - were so dysfunctional that they would not fit the bill as far as the Kalpakkam project was concerned.

In fact, while providing the components France made it clear, according to DAE circles, that it would give no performance guarantee in the event of the DAE attempting to retrofit and use them in the FBTR.

But now. with new nuclear tie-ups being envisaged with France, attempts to import components and somehow salvage the project are going on at desperate speed. This is supported by the projected expenditure allocation of Rs.36.62 crores for the Indira Gandhi Centre for Atomic Research (IGCAR).

Senior engineers and scientist are, however, firmly of the view that the project cannot be salvaged at any cost. They are also very critical of the DAE's decision to go ahead with the design of the 500 MW prototype fast breeder reactor.

Dr.Paranjeepe, director of the IGCAR flatly refused to give any Information on the working of the fast breeder project. He just kept asserting that the information gathered by the journalist were "unauthentic" and "unsubstantiated."

Dr.Paranjeepe however, reluctantly admitted that there were "some minor problems" in the FBTR, which would be rectified in the "near future." He refused to divulge the specific nature of the problem.

The scientists at the IGCAR do not rule out the possibility of an accident, as they feel that the radioactivity of the fuel rods may trigger off a fusion process before they are removed from the core, which may be uncontrollable. They are, however not prepared to reveal the real threat, constrained as they are under the Atomic Energy Act 1962, which forbids them from revealing any classified information. Yet they maintain that the chances of Kalpakkam becoming another Hiroshima are higher than it becoming another Chernobyl.

Zebra Mussels Take on Nukes

Zebra mussles are smelly, calm-like parasites which grow to approximately three centimetres in length. As unimpressive as they may appear, these creatures have a lot of people in the Great Lakes basin of North America scrambling for a way to kill them off. Experts believe that these organisms came to Great Lakes in the ballast water of foreign ships, in a new development, a US scientist has discovered that potassium is lethal to the mussels. Potassium is a cheaper and less environmentally harmful alternative to chlorine, ozonation or hot water.

Originally from the Black Sea, Zebra Mussels were first noticed in Lake St. Clair in 1988. By 1989 they had infested Lake St. Clair and Lake Erie, and by March 1990, they had spread to parts of the other lakes and rivers in the system. Adult Zebra Mussels have also been found at the Bruce Nuclear Generating Station on Lake Huron.

The larvae attach themselves to hard surfaces at densities of upto 700,000 organisms per square metre. Once they mature, a thick, hard coating of adult mussels cover the surface. Consequently they have significantly reduced the flow into several municipal, power plant and industrial water intake pipes in both Ontario, Canada and U.S.

Nuclear power station operators in the US have repeatedly experienced "biofouling" problems over the last decade. The Nuclear Regulatory Commission (NRC) Information Notice # 89-76, to all operators of nuclear power reactors, identifies Asiatic Clams, American Oysters, Blue Mussels and Zebra Mussels as species of particular concern. This notice outlines regulations for prevention of biofouling and states that "the potential for biofouling has been of concern to the NRC since 1980 because biofouling can compromise the vital transfer of heat to the ultimate heat sink." In other words, Zebra Mussels have great potential for plugging cooling systems. Zebra Mussels have given us yet another reason to move away from dependence on large, centralized generating stations.

Rod MacLeod
Nuclear Awareness News Summer/Fall 1990

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A Journal Devoted to Non-Nuclear India

Volume 4 Number 4 **February/March 1991**

if I fail
to work the horror
into a play
of voices in which the living and the dead
live again

who will forgive me

. Marc Kaminsky

The Road From Hiroshima

The United States' government often considers itself the world's policeman. And, like the police in most parts, it conducts itself in a manner as if it was above the laws which govern civilized behaviour.

Forty five years ago, US brought nuclear misery upon the world by being the first and so far the only nation which has used an atomic weapon on another. It was an event that shocked everybody. An American poet, Marc Kaminsky, puts it rather well

Whatever you hear
about Hiroshima
whatever wild stories you hear

all of it happened.

Last month US again crossed the line. This has been done with so much impunity and with so little outrage and condemnation from the rest of the world that one shudders to think of what life is going to be like in the "new international order" that is to follow this carnage in the Gulf. The bland, almost aseptic statement, "Iraq's nuclear capability has been destroyed" hides an enormous crime. What has been done is the bombing of an operating nuclear reactor and the willful spread of radioactive pollution. Cleaning up this mess, once the war ends, is going to be a difficult task and one which will contaminate many more people. Even Israel - a country whose government has often in the past acted in a high-handed manner - has never committed such an atrocity. The bombing of Iraq's Osirak reactor by Israel in 1981 and later by Iran during the Iran-Iraq war was done at a time when the reactor was not operational and did not contain radioactive poisons.

Iraq is a signatory to the Nuclear Non-Proliferation Treaty (NPT), and its nuclear facilities are thus subject to inspection by the International Atomic Energy Agency (IAEA). The last IAEA inspection of Iraqi facilities was carried out in November 1990 and provided no indication that Iraq was in the process of building nuclear weapons. Thus, the bombing of these facilities besides setting a new and altogether dangerous precedent also tells the rest of the world that NPT is not worth the paper it is written on, and that powerful countries have no faith in the process of international inspection. The fact that the bombing took place just after the ratification by the Soviet Union and Western countries of the first addition to the Geneva agreement of 1949 prohibiting attack on nuclear installations in wartime, just makes the act doubly shameful

Second World War documents indicate that Hiroshima was not the last event of that war but the first event of the Cold War — its real purpose (contrary to much advertised claims) was not so much the destruction of the Japanese will to pursue war as much as to intimidate the Russians and other allies of US with a demonstration of American military might. Then too, a new post war world order was just emerging and the US wanted to show that it would brook no questioning of its "God" given supremacy. If in the process, Japanese women and children and their children were to be consigned to atomic hell—well, they were only Japs. The brutality showed in the wanton destruction of Iraq displays a similar disregard for the sanctity of human life.

Saying all this in no way constitutes approval for the actions of Saddam Hussain. He too has been an international thug! His use of chemical weapons against Iran and even worse against his own Kurdish minority was a gross violation of the norms of civilized behaviour. There can be no doubt that he needed to be effectively curbed; but it is not for those who armed him and were responsible in allowing him to become a monster to now crush him through recourse to even more heinous actions directed against the people of Iraq.

What are the implications to us of a world where nuclear reactors are considered "fair-game" during wartime. We have a large number of nuclear facilities located all over the country each of which is now a greater threat to the surrounding environment and the populace. Unlike the Iraqi reactors which were small in size, our power reactors are huge by comparison and contain much larger amounts of radioactive poisons. Nucleocrat would contend that they are protected by "double containments" — thick steel lined concrete wails which can presumably withstand earthquakes and enemy attacks. However, as the Israeli demolition of Iraq's Osirak reactor in 1981 showed, this assurance is as worthless as other nucleo-assertions. Even if one were to grant it to be true, no concrete walls protect the spent fuel storage pools adjacent to the reactors and if a bomb were to land in one of those, it would be a major catastrophe. In this connection special mention must be made of the hazards posed by the research reactors at Bombay. Though they are smaller in size, they none-the-less contain significant radioactive toxins and are moreover located in an extremely densely populated area. Thus any dispersal of radioactivity would immediately affect a large number of people. The only comforting thought in all this is the ratification by India and Pakistan of an agreement to not attack each others nuclear facilities. But then, in today's world, agreements are made on paper and not in the minds of the people.

Today, we are again on the verge of a new world order. The Cold War has ended. "Evil Empire" is breaking into pieces. But are the Americans - the self proclaimed good guys, not empire builders? Is their proposed new order something that any self respecting individual or nation can subscribe to? It behoves the mighty to act with justice and compassion. The present leadership in America has shown that it is untouched by either. Truly all the wild stories you may hear of Hiroshima, happened. They are happening still.

Surendra Gadekar

An Everyday Affair

Forty spent nuclear fuel elements have arrived for reprocessing at the Dounrey reprocessing facility in Scotland. The fuel rods were transported from a research reactor in India by a normal cargo ship and passed through the Gulf area. Dounrey authorities claimed that they had done so before the Gulf war began.

The fuel was supplied to India during the 1960s, and has now been returned at the end of the contract period. Dounrey is not releasing all the details of the transport but the authorities there have confirmed that it was carried in a normal cargo ship and not in a ship purpose-built for handling dangerous highly radioactive cargo.

'1 find it hard to believe that they could have been so irresponsible. Why could they not have waited a few months? After all the fuel has been in India for nearly 30 years. And why could they not have completely avoided the Gulf and instructed the ship to go around Africa?" said Chris Bunyan of the Northern European Nuclear Information Group. He added that it was irresponsible to transport such dangerous cargo - of nuclear weapons grade material - anywhere near the Gulf even before the war started, but to have transported it using an ordinary cargo ship just adds to that irresponsibility.

Source: WISE News Communique No 346

UNALLAYED FEARS

The greatest dilemma which the nuclear establishment in the country has encountered has been: whether to abandon a crippled nuclear reactor or to salvage it by yet to be proven technology exposing workers to high doses of radiation. That, in short, is the story of the Rajasthan Atomic Power Project's first unit (RAPP-1).

It is three years since the Nuclear Power Corporation (NPC) submitted its report to the Department of Atomic Energy (DAE), outlining the extent of damage to, and recommending the replacement of an endshield of the RAPP 1. The endshields at each end of the reactorvessel serve as protection against radiation and high temperature, besides providing support to the coolant tubes. The cylinder shaped reactor vessel houses 306 calandria tubes. In every calandria tube is lodged a coolant tube, each of which comprises 12 uranium bundles. Heavy water flowing through these tubes carries the heat generated in the reactor to the boilers.

DAE Apathy

At RAPP-1, a paucity of funds, coupled with a lack of advanced technology and the general apathy of the DAE have led to undue delays in undertaking the rehabilitation of the crippled unit. Though aware of the dire consequences of such delay, the country's nuclear power authorities seem to have done little about it. A bigger crack in the end shield may result in the leakage of light water leading to a loss of coolant phenomenon and a consequent catastrophe.

Thete are two kinds of costs involved in running a crippled unit. One is the increased risk of a disaster. This cost one has to pay if and only if a disaster strikes. But if there is a major accident, the cost as shown by Chernobyl would be crippling. But there is also another cost involved - one *which moreover, one has to pay in any case. This is the Increased radioactive burden on the surroundings. The more radioactive the structure, the higher it is going to cost to decommission it and store the wastes, both in terms of money as well as in terms of the radioactive burden on the workers. Thus many utilities abroad find it cheaper to shut down old reactors rather than to continue running them at reduced output and to pay astronomical decommisioning costs later.*

The precursor of NPC, the Nuclear Power Board, had submitted a preliminary report on the damaged unit in 1986. In early 1988, NPC made a detailed report supporting the proposal for replacement of the south endshield. The estimated cost of removing the damaged endshield and installinga new one was pegged at Rs. 50 crore. Having received the report,, DAE forwarded the same to Atomic Energy Regulatory Board (AERB) to oversee safety requirements for undertaking the task. The DAE, however is yet is yet to sanction the amount.

The cracks on the south endshield were first noticed as early as September 20, 1981. They were discovered by the by the scientists when the reactor was brought from Canada in parts and assembled here. The defective portion had then been repaired by welding, but 'stress relieving' could not be carried out due to the absence of the necessary facilities at the site then.

Damaged Reactor

During reactor operations, cracks appeared around the affected area due to the effect of high neutron radiation. The cracks have resulted in a leakage of light water which the NPB report considered a serious incident, likely to result in possible defects. Mechanical means havingbeen used to plug cracks, there are apprehensions that the workmen involved in the operation may have been exposed to high levels of radiation.

Preoccupied as it is with the generation of power, the DAE has been unable to allay the fear of exposure. It took four and half years to plug the cracks and the unit started producing electricity after receiving a clearance from the safety committee which approved of the repairs.

RAPP-1 has in effect been used as a prototype by nuclear technologists. First, they were in such a great hurry for bringing the benefits of nuclear power to India that they went in for a full fledged plant without acquiring any experience with a small sized prototype. Then, when its performance turned out to be a total flop, all they did was to perform a semantic trick — they decided to call it a prototype. The problems encountered were not only with the conventional parts of the system like the turbine as mentioned in the artivcle but with everything imaginable — large leakages of heavy water and an inability to make heavy water within the country; (this /ed to adoption of unconventional and hazardous operating procedures); unavailability of spare parts, troubles with the grid; labour problems; troubles with the emergency core cooling system; cracks in the endshield; what have you- the list is endless

The reactor tripped again on May 20, 1985. Cause: the cracks which had been repaired had widened. The safety committee put its foot down and advised a permanent shut down of the unit which it believed could not be repaired. But the DAE prevailed over the safety committee and by developing an advanced technique of chemical plugging, succeeded in plugging the cracks.

The repaired unit was once again synchronized with the grid on February 29,1988. The repairs cost Rs. 1.2 crores. However, the cracks and consequent repairs had taken their toll - from an installed capacity of 220 MW, the unit is currently being run at 90 MW.

Ever since it was commissioned, RAPP-1 has been a problem unit. Plagued by frequent tripping, its overall performance has been rather poor because of grid problems, and difficulties arising from the use of conventional equipment like the turbine.

The frequent tripping of the reactor is traced to a fundamental error that was apparently made during the planningand design of the reactor. In the absence of data with regard to the water temperature from the Rana Pratap Sagar Lake, on whose banks RAPP is situated, the Canadian contractor's designed the plant according to the lake temperatures prevailing in their country. The temperature of the lake was taken to be 21 degrees centigrade, though later it emerged that the lake's temperature was around 31 C. Thus the units will never be able to achieve the 220 MW capacity and can at best generate only 198 MW of electricity, the DAE's claims of having achieved the installed capacity generation notwithstanding.

This excuse is really the limit. Pray, how difficult it Is to obtain data regarding a lake's temperature? The Canadians obviously designed reactors to suit their own conditions. When we decided to Import their technology, they were obviously not going to redesign the plant just to suit us. It was our need and the onus was on us to do the redesigning. We preferred to borrow their design wholesale without a thought regarding our conditions. We deserved what we got - a substandard machine and plenty of headaches.

Moreover, the reactor has tripped 300 times till date, weakening the system which has not been insulated against such thermal shocks. It takes 36 hours to restart the nuclear power station after tripping.

If the NPC's technical report is accepted along with AERB rider for safety requirements, unit -1 will have to be shut down for at least four years to facilitate the removal and subsequent erection of a stainless steel endshield.

Post-facto Prototype

Experts feel that the removal of the endshield is technically feasible. But the question engaging the minds of engineers whether such an exercise will be possible given the limited space within the reactor building, and the proximity of the endshield to the reactor vessel which has a radiation level of 100 Roentgens per hour.

Though the Bhabha Atomic Research Centre has the expertise for remote controlled handling of equipment exposed to radiation, it has not been put to industrial use yet. An expert states that "the present technology is limited to the changing of fuel bundles alone, and no one has yet conceived the possibility of changing the endshields nor initiated work in this regard."

DAE asserts that the job has to be necessarily undertaken in view of the similar designs of three other plants: RAPP-2 and both units of Madras Atomic Power Station (MAPS). "Rather than write off the crippled unit, it is economical to go in for repairs as it would provide us the technical competence and expertise to handle such jobs in the future," observes a NPC official.

Officials of the AERB, however, feel that in the event of an emergency, the shut down will be hurried and safety precautions will not be taken. Nuclear Power Corporation oblivious of future catastrophe, is keeping the unit running, for fear that a power shortage in the state may evoke adverse public reactions. "NPC is likely to continue underestimating the problem until more cracks appear," an AERB official remarked.

The sad part of this prototype saga is the fact that it is the poor innocent children of the surrounding villages who have had to pay the real costs of training nuclear technologists In the form of Illnesses and tumours. (See "Chernobhata" In Anumukti Vol.4 No.1)

NPC managing director S.L.Katti has admitted that the DAE will be approached for funds to undertake the repairs. A major portion of NPC's activities is funded by the DAE. In 1988-89 it received over 80 per cent of Rs 1459.15 crore from DAE.

Unsolved Mess

Katti stated that the job of removing the endshield could be undertaken only when the coolant channels are removed the next time which will be four to five years from now. He was emphatic that there were no immediate plans to take up the job also because proper remote tooling to handle such an operation was yet to be developed. "BARC has developed and tested remote tooling to handle other hazardous operations which could be helpful indevelopingspecialized toolingneeded for our job," he said.

Admitting that it was uneconomical to continue to run RAPP-1 at 85 MW, Katti indicated that the Rajasthan State Electricity Board is likely to be approached soon with a proposal for a hike in power rates. "If they do not approve of the hike, they may have to do without power from our plant," he said.

Rather than admit the non-availability of funds and technology to undertake the changing of the endshield, the DAE consistently makes statements to the effect that "repair works of the kind never undertaken anywhere in the world are in progress."

Successive DAE secretary's from Dr Raja Ramanna to Dr M R Srinivasan in order to wiggle out of the mess have time and again stated that RAPP -1 was an imported reactor which was still to be commissioned by the exporting country itself. It may be pertinent to point out that the Douglas Point reactor in Canada (on whose design RAPP was based) developed similar problems and was prematurely shut down.

If RAPP-1 was a prototype whose performance had not been assessed, why did the DAE rush ahead with commissioning other similar reactors in the country such as RAPP-2 and both units of MAPS, without first evaluating its performance? The nuclear lobby is unwilling to answer this.

SOURCE: Kumar Basu in The Independent February 20, 1991.

Keep Taking the Tablets in Case of Mishap

Amid rising fears about the safety of one of Central Europe's biggest atomic power plants, pharmacies in Austria and Czechoslovakia are to distribute potassium iodide tablets to help protect their populations in event of a nuclear accident.

The Austrian health ministry said the tablets,a precaution against radiation-induced thyroid cancer, would be made available free of charge in the next few days to children, pregnant women and nursing mothers. Czechoslovakia has already begun providing the pills within a 20 mile radius of the nuclear power station at Jaslovske Bohunice in Southern Slovakia. The thyroid absorbs iodine from the tablets and becomes saturated thus preventing further absorption of radioactive iodine from any accidental release.

An Austrian government commission concluded last month that unsafe conditions at the plant, 35 miles across the republic's northern border, threatened a new Chernobyl-like disaster. Austria's socialist chancellor, Franz Vranitzky, responded to the report by demanding that Prague shut down the plant, which uses Soviet made pressurised water reactors of the WER-440 type. (Quite similar in design to the one's now planned at Koodankulam in Tamilnadu — Editor). He offered provisional deliveries of free electricity to Czechoslovakia to make up for the power lost by a shutdown, and has called for a Central European zone free of nuclear power stations.

A fire at Bohunice on 15 January and another six days later at Czechoslovakia's second nuclear power station at Dukovany has increased Austrian fears about its neighbour's reliance on atomic energy. No one was injured in the fires and the Czech authorities say that there was no release of radioactivity

Austrian economics minister Wolfgang Schussel said that the compensatory supply of power to Czechoslovakia would cost $330 million per year. Austrian power plants were capable of filling in for Bohunice "with some effort, " Schussel added.

While a 1978 public referendum banned the use of nuclear power stations in Austria, Czechoslovakia depends on them for a quarter of its electricity. International pressure to cut this comes at a time of rising economic difficulties in the transition to a market economy.

The Czechoslovak government acknowledged last year that the Bohunice plant did not meet international safety standards. However, it says that it has been advised by the West German company, Seimens and Westinghouse of the US that the plant can be modernized and remain in operation.

Austria's offer to supply alternative electricity has so far met with scepticism among officials in Prague.

Michael Wise in The Independent - London

SKYROCKETING NUCLEAR COSTS

Since 1980, the construction cost for nuclear plants in the US has increased four-fold, while operating and maintenance costs for existing plants increased more than 10% annually, despite extensive government support. Proposed new nuclear power plant designs have serious safety shortcomings and would be among the most expensive options for producing electricity.

-WISE NEWS COMMUNIQUE 344

Chernobyl Reactor's Next of Kin

Below we reproduce a letter written by nine environmental organisations in Canada to The Canadian Prime Minister urging him to reject a loan application from Romania to complete construction of five nuclear power reactors at Cernavoda. We are doing this because firstly we strongly endorse the sentiments expressed in the letter and secondly also because India too has gone in a big way for CANDU type reactors and many of the observations contained in the letter are of relevance to us.

We are writing to oppose the proposed extension of the loan for building Candu reactors at Cernavoda, Romania. We call upon all members of the House of Commons to refuse further funding for the project.

Nuclear power is dangerous, expensive and unnecessary wherever it is proposed or tried. Romania is no exception, and the lack of democratic mechanisms in the country make nuclear power an especially risky venture.

Nuclear power is dangerous, and may be more so in Romania. One concern is the nuclear weapons connection. Ceausescu boasted that with the Candu, he also had atomic bomb capability, and the regime that replaced him may have similar intention.Every Candu customer thus far—India, Pakistan, Argentina, Korea — either has the bomb or is reported to be working towards it.

Another threat is the possibility of a major accident such as the one at Chernobyl. The ingredients that caused the accident at Chernobyl — design flaws, operator errors and situational circumstances — all have parallels at Cernavoda.

- The Candu shares a design flaw with the Chernobyl reactor - a flaw that was a major contributor to the accident. The flaw, known to nuclear engineers as a positive void coefficient, causes the reactor to accelerate in the event of cooling failures. Massachusettes Institute of Technology's *Technology Review* magazine (July 1989:50) described the CANDU as the "closest operating relative"to the Chernobyl reactor on the basis of this shared design fault.

- Labour problems at the Cernavoda plant may already have jeopardized safety. A CANDU reactor operating in Romania will have to contend with a relatively unskilled labour force in both its construction standards, and with what appears to be conscripts still working at the site against their will, the possibilities for accidents by neglect or sabotage are enormous. Recently released documents indicate that Atomic Energy of Canada Ltd was forewarned of the problem with forced labour and poor construction work, but proceeded with construction and was unable or unwilling to prevent the problems from occurring.

- The technological infrastructure and services (evacuation plans and medical expertise, for example) are not likely to be better in Romania than they were in Ukraine. We have no reason to believe that the Romanian government will be more accountable to its people than was the Soviet government: it took days for Moscow to admit that there had been an accident at Chernobyl, and even four years after the accident, local populations are still being moved from the accident area — people were unnecessarily exposed and this could happen again at Cernavoda.

At a time when powers were being devolved from the central dictatorship in the Soviet Union to local and state governments, the people living near the Chernobyl reactors were finally able to do what they have wanted to do for years - shut them down. The Ukranian legislature has moved to close the last of the Chernobyl reactors by the end of this year. Had this movement towards democracy been made five years ago, the world might have been spared the legacy of radioactive pollution that Chernobyl wrought.

People all over the world, when given a chance, usually say "no" to nuclear power. Referendums in Italy, Switzerland, Sweden, Austria and California have led to moratoriums on nuclear power development and, in most cases, the premature closure of operative reactors. Upon supplanting totalitarian regimes, democratic governments in Poland and Philippines ended their country's' nuclear power programmes. Since the advent of Perestroika in the East Block, people have used their new found access to information and freedom of protest to launch a passionate and effective antinuclear movement: over 55 nuclear facilities have been closed or canceled in the East Block since the accident at Chernobyl.

Romanians do not have the opportunity to say "no". The Romanian people have neither been in-

volved in the decision to develop nuclear power nor duly informed of its risks. There is much evidence to suggest that the Romanian government is till abusing human rights and is unaccountable to its people. Canada should not be a party to the Romanian government's efforts to foist such a dangerous and unnecessary technology upon the people of that country.

That romania is experiencing a severe shortage of power is undeniable: new supplies of electricity must be found and existing supplies must be more efficiently used and more fairly allocated. However, environment and society are sure to suffer if decisions regarding the provision of power are made without public participation. Intelligent decisions regarding development and the environment cannot be made in isolation from the crucial checks and balances that come with public scrutiny.

Romania should be able to meet its need for electricity with a mix of efficiency improvements, co-generation and other small renewable energy technologies: therefore nuclear power is unnecessary. We, therefore call upon the government to cancel further consideration of this loan.

Contact Address and letters of support to:

Norman Rubin, Energy Probe
225 Brunswick Avenue Toronto
Canada M5G 1L5

The Glare of Public Scrutiny

NNucleocrats all over the world lie so often that it should come as no surprise that they sometimes get caught. We have often in the past referred to the fact that the stated nuclear costs bear no relationship to reality. Thus the statement, often made for the sake of comparison with coal fired plants, that reactor A has been producing electricity at x paiseper unit, properly belongs to a work of fiction. The following article is significant for two reasons. Firstly, it is the report of an official committee and secondly because it appeared in ***ATOM:*** *the journal of the United Kingdom Atomic Energy Authority. It was, characteristically hidden on page 29 of the October 1990 issue under the heading:*

House of Commons

Energy Committee Report: The cost of nuclear power

The Energy Select Committee under the chairmanship of Dr Michael Clark has published its fourth report, 'The costs of nuclear power" The committee states that:
'The purpose of our enquiry was not only to examine the reasons for the perceived increase in the cost of nuclear power, but to discover why, despite this Committee's warning, the government did not recognize more quickly the level of costs, and why it embarked on a policy of privatising nuclear power which the high cost and substantial risks of nuclear power eventually forced it to abandon."

"Nuclear power has long been presented by the government and electricity utilities as cheaper or potentially cheaper, than other forms of generation. The Central Electricity Generating Board (CEGB) in 1988 informed the Hinkley Point C public inquiry that the "economic resource cost" of the proposed Pressurised Water Reactor would be 2.24 pence/kWh, less than for coal fired generation (at 2.50 to 2.62 p/kWh, depending on whether the station was coastal or inland). Yet subsequent nuclear costing have been considerably higher than those for fossil-fired generation. National Power later put the lifetime "private sector price" of PWR generation (calculated on a different basis) at 6.25 p/kWh whereas it suggest that the same for fossil-fuel fired plant would be between 2 to 3 p/kWh.

The Committee summarized its main conclusions as follows:

- Different rates of return in the public and private sectors for investments involving similar risk are an invitation to misallocate resources by spending money on relatively high risk, low return public projects, and the CEGB and the Department took too little account of the risks borne in the public sector.

- *We reject the belief* of CEGB and the Department *that different assumptions* as to availability and other uncertainties *should be made according to whether a project is in the public or private sector.*

- *We reject the view* of CEGB and the Department *that the cost of electricity from a reactor could be almost doubled* by priva-tisation, and we are *profoundly concerned that* the *CEGB should have put a low figure to a public inquiry* in support of the case for a major public investment *and one almost twice as high shortly afterwards* for power from the same reactor in the private sector.

- The transfer of risks from utilities to the consumer or the government *has constituted an unacknowledged and major subsidy over the years to nuclear power.*

- We are convinced that there has been *a systematic bias* in CEGB costing *in favour of nuclear power,* both in ignoring the risk and failing to provide adequately for contingencies, and, in respect of investment, in putting forward 'best expectations' rather than more cautious estimates.

The Committee recommended :

- The Department of Energy and the regulator should publish comprehensive information on how the fossil fuel levy (which subsidizes at present the nuclear electricity generation in UK) is set and the reasons for any changes.

- As a matter of urgency, the Department of Energy should estimate as accurately as possible the costs of completing and operating Sizewell B during its intended life compared with the costs of canceling it and generating the same power from other sources; and in so far as continuation is justified by non-economic benefits, comparison should be made with the cost of alternative ways of achieving those benefits. The Department should publish the estimate, explaining how it was calculated.

  Any costs involved in extending the lives of magnox reactors should be fully and publicly accounted for, using a rate of return on avoidable costs comparable to that of other forms of electricity generation and removing any distortion caused by the fixed element in British Nuclear Fuels Ltd's charges.

- *It is essential that if further nuclear investment is justified in 1994 on grounds of diversity of supply or reduced pollution, the economics of nuclear power are in no way glossed over, that the full costs and risks of nuclear power are ascertained as closely as possible, and that the analysis is fully exposed.*

From Hiroshima to Rokkasho

In Gujarati, Rokkasho means asking for a halt. For a while it looked as if this tiny village in Aomori prefecture on the northern tip of the main Japanese island would really live up to its Gujarati meaning, and bring to a halt the Japanese nuclear expansion programme. Unfortunately, the victory of the pro-nuclear Masaya Kitamura, in the election to the governership of Aomori prefecture, due to the division of the antinuclear vote amongst two candidates who together polled some 100,000 votes more than him, has given a new lease of life to one of the biggest programmed assaults on the environment anywhere in the world.

Engine of Nuclear Industry

Japan is one of the leading industrialized nations. However, it is very poor in energy sources and has to import most of its energy in the form of oil, coal, and uranium. Thus the appeal of an indigenous energy source, independent of the vagaries of world politics, is very strong to the bureaucrats and industrialists who run Japan. They view the growing pile of nuclear waste from reactors, as their very own plutonium mine. Presently 30 percent of Japan's electricity comes from nuclear sources. The plan is to raise this to 40 per cent within the next two decades, based primarily on plutonium.

This continuing drive towards nuclear is what makes Japan unique amongst OECD countries. In all other rich, industrialized nations nuclear programmes are being wound down. There have been very few new orders for nuclear power stations within these countries. Nuclear industry for survival depends on suckers in the Third World. However, leaders of these nations though eager to traverse the nuclear path don't have the wherewithal to match their sky-high ambitions. Thus, Japan has during the last decade,become the engine of the world nuclear power industry with its demand sustaining technologies in -US and Europe. "There are many lessons to be learnt from Japan by the rest of the world on how to construct and operate nuclear power plants" says Kent Hansen, who chaired a recent US government study on Japan's nuclear policies.

However, the pro-nuclear consensus that made it all possible began to erode following the Chernobyl disaster of 1986. Matters got worse in January 1989 when a damaged pump forced the Tokyo Electric Power Corporation to close down a reactor for nearly two years. A government survey carried out in September last year showed that while two thirds of the Japanese public thought nuclear power was necessary, over 90 per cent had anxieties. A major cause for the anxieties besides the fear of accidents is the fact that Japan has as yet no place to store both the high level as well as low level radioactive waste

Biggest Nuclear Complex

The centre-piece of the Japanese nuclearization policy is the sprawling, ($9.09 billion) nuclear fuel complex to be built at Rokkasho. When completed, the facility, which consists of an uranium enrichment plant, a large reprocessing plant to recover plutonium from spent fuel and a radioactive waste storage center, would be one of the biggest nuclear centres in the world. It should come as no surprise to those conversant with 'development' to know that Rokkasho and indeed the whole of Aomori prefecture is the poorest of Japan's 47 prefectures with the sole exception of Okinawa. The weather is harsh and the infrastructure is patchy. It is also home to other such 'development' projects which the Japanese government considers necessary but undesirable. It is unsuitable as a nuclear site since it is a region of geological instability with high ground water level. A still more ominous feature of the site is that all the facilities will lie under the "specially controlled sky area" of the US and Japanese air-forces since Rokkasho is situated very near to both Misawa air base and Amagamoriair-to-ground gunnery and bombing range. There have been ten aircraft related accidents there in the last five years includingF16 fighter bomber crashes and erroneous dropping of dummy bombs in the surrounding area.

Worried Proliferation Experts

It is not only the local farmers and fishermen who are worried by the Rokkasho complex. Nuclear proliferation experts in the US and Europe are equally worried. The facility, "does not make economic sense and the plutonium glut it creates could be inflammatory at home and abroad, " concluded a recent study by the Science Policy Research Unit at the University of Sussex in Britain.

Presently, Japan' exports almost all its nuclear waste to France and Britain, which have large reprocessing plants of their own. These countries are supposed to extract the plutonium and then ship it back to Japan along with other radioactive garbage produced by the reprocessing Process starting from next year. However, the logistics of this massive radioactive transport is getting complicated. Originally, the plan was to airlift the stuff over the north-pole. That plan has now been discarded since Japan was unable to prove sufficient crash protection. Now, the idea is to start regular shipments of as much as 30 tonnes of plu-tonium over the next decade. Since that is worth thousands of bomb-worth of plutonium protecting these ships from terrorist attacks is going to be a serious problem. Besides, there is an urgent need to store the junk somewhere. Hence the attraction of Rokkasho to Japanese policy makers.

High Level Dump

The Low-Level Radwaste Storage Center where these and other radioactive wastes are to be kept is a misnomer. What it actually denotes is a high level permanent dump. The Atomic Energy Commission of Japan defines low level waste as one that contains no more than 2.5 Curies of radioactivity per ton, whereas at the storage center more than 100 Curies per ton would be permitted. The reason for this high level is that the materials stored in the drums, like used ion-exchange resins, contaminated gloves and clothing are presently incinerated to reduce the total volume of the waste, resulting in a much elevated concentration of radioactivity. Consequently, the radiation level at the surface of a single drum would amount to 1 Roentgen per hour. The plan calls for burying 200,000 of these drums in the initial stage, which would last for a period of ten to fifteen years. During this time, the pit would be open to facilitate burial. Therefore, even under 'normal' conditions, with no accidents local residents would be exposed to this high level of radioactivity.

Plutonium Surplus

The Japanese government and industry have repeatedly asserted that the shipments of plutonium from Europe are necessary if a shortfall in supply of plutonium to research reactors is to be avoided in the early 1990s. However, several studies indicate that this is just not true. A study carried out by J.Takagi and published in the *Bulletin of Atomic Scientists* shows that Japan's stockpile of surplus plutonium will amount to as much as 50 tons by the beginning of the next century — an amount sufficient to produce thousands of atomic bombs. This is a chilling prospect for anyone concerned with nuclear arms proliferation.

The government strategy to cope with this surplus plutonium is to burn it in conventional reactors as MOX (Mixed Oxide Fuel of uranium and plutonium). However, the long term future of this strategy is still in doubt since ever increasing costs of reprocessing coupled with the continued low costs of uranium make this option uneconomical.

Thus, even inside the world nuclear industry, scepticism is growing regarding the rationale for plutonium recycling. Japanese government seems to be quite alone in its willingness to promote the plutonium business. The future of world plutonium Industry now hinges upon the attitude of Japanese nuclear industry.

It is a long way from the suffering of Hiroshima and Nagasaki to being the nuclear engine of the world. The fact that it has been traversed shows that hunger for power is a madness that does not respect geographical boundaries or historical experience.

Nuke Info Tokyo No 20 & 21.

"No" to Jellyfish Babies

Historically, most attention to nuclear issues has focused on the concerns of the rich states of the northern hemisphere, while some of the greatest instances of nuclear pollution have been in the islands of the Pacific.

- Since the Second World War, 238 nuclear bombs have been blasted in the Pacific islands. 14 of the Marshall Islands were made uninhabitable by U.S.testing.
- Between 1946 and 1970, the U.S. dumped 100,000 curies of radioactive waste in Pacific Ocean sites.
- In 1979, Japan announced its intention to dump 10,000 drums filled with low-level radioactive waste at a site north of Marianas Island on an 'experimental' basis.
- In 1980 U.S. and Japan launched a joint feasibility study for the storage of spent nuclear fuel from Japan, Taiwan and South Korea in the U.S. Trust Territories in the Pacific. The results have not been announced so far.
- Ruptured waste containers and radioactivity above normal levels has been detected off the coast of French Polynesia following weapons testing. The French blithely continue to test.
- In 1982, the U.S. Navy announced that it intended to sink at least 100 obsolete nuclear submarines in the Pacific during the next three decades.

Throughout Micronesia, there have been virtual epidemics of cancer and thyroid tumours, with women and children the principal victims. A macabre and increasing problem in the Pacific is what has come to be known as "jelly-fish babies" — babies born with no separately formed heads or limbs who die a few hours after birth.

Realizing the danger to their children and their progeny, women in the Pacific have decided that they will not allow this "sword" to hang over their heads anymore. They have joined forces to oppose the militarisation and the pollution of their land and water. They are asking women around the world to join them in providing a support and form an information network. As a step in this direction, Women for Mutual Security (WMS) - a coalition committed to world peace and common security sponsored the International Pacific Policy Congress from January 7th to January 12th, 1991 in Port Vila, Vannatu.

The conference brought together women activists from the Pacific, New Zealand, Australia, Africa and North and South America. The participants decided to take the initiative in informing women's movement activists around the world of the status and the effects on women and their families of nuclear and missile tests, military stockpiles and the dumping of hazardous chemical and nuclear wastes in and around the Pacific Islands. They also decided to work closely together and with other groups working in the Pacific on different issues such as environmental hazards, problems of indigenous people, the women's movement peace and development issues.

WANE Declaration of Support

The word radiation is not new for us in Kerala. The coastal sands of Alapad, Ponmana, Chavara, Neendakara in the Kollam district contain large amounts of radioactive thorium. The people living in these areas have been subjected to some of the highest natural background radiation in the world for centuries. We see the ill effects of this radiation on them in the form of higher incidence of all sorts of diseases and a large number of Down's syndrome children. (For a detailed description please see the January 1991 issue of *Safe Energy and Environment* -Editor)

Though the birth of a physically and mentally handicapped baby is a problem for the parents, family and the society at large, the whole responsibility of the child is entirely on the mother, in the present social set up. Pregnant women and developing infants are most vulnerable to radiation. We see the devastation of the earth by the corporate warriors and the threat of nuclear annihilation by the military warriors as feminist concerns.

We don't want to live on a dying planet, drinking its poisoned waters, eating its irradiated food and breathing its contaminated air. We envisage our life as being in harmony with the life of the planet as a whole.

We strongly protest and raise our voice against the injustices being perpetrated on our sisters in the' Pacific. We urge individuals and groups everywhere to join hands with us in extendingsupport to Women for Mutual Security in their activities and struggles.

Please send your letter of support to:

Women for Mutual Security,
1. Romilla St. 146, 71
Kastri, Athens, GREECE

Ms. Nandini

Women Against Nuclear Energy,

X/526, Koyickal House, Kottayam-2, Kerala

Business Before Bombs

Hindsight, it is said, is always twenty twenty. Perhaps. But are the lessons learnt from the bitter experiences of the past any use in moderating future excesses? Not, it would seem, when there are profits to be made.

"Misleading labels for technological projects can conceal important policy issues. "Project Plowshare" was the name given in 1950s to the plan of using nuclear explosions for peaceful purposes — the labelling was plainly misleading. It made it easier for Indians to pretend that their nuclear explosion served only peaceful purposes. People think of swords that have been forged into plowshares as harmless because they cannot be used for war: but so-called "peaceful" nuclear explosions can destroy a city. Indeed, a basic weakness of some of the past policies has been the assumption that an application of nuclear energy will not be of military use simply because it has some civilian use."

The above is a quote from Fred Charles Ikle, who • served under Presidents Nixon and Ford as Director of U.S. Arms Control and Disarmament Agency. The article from which this quote has been taken appeared in *Bulletin of Atomic Scientists* of January, 1980. It is based on his foreword to the book, *Swords from Plowshares,* edited by Dr .Albert Wohlstetter and published by the University of Chicago Press in 1979. The research on which the book is based, according to Ikle, "revolutionized thinking in the United States and in other countries as well, leading the way to radical new departure in U.S. non-proliferation policy."

Unthinkable to Forego Nuclear Power

Tracing the history of non-proliferation efforts Ikle goes on: 'That it is undesirable for atomic weapons to spread is an idea as old as the nuclear age. And it was recognized from the very outset that the peaceful applications of nuclear technology would therefore have to be restricted. This was the outlook in 1945. It was natural and easy for President Truman and the Canadian and British Prime Ministers to agree that there should be no disclosure of information, "even about the industrial applications" of atomic energy, until an international system of control was set up. Some twenty years later these priorities had become completely reversed. In 1968, U.S.A.'s ambassador Arthur Goldberg told the United Nations that it would be an "unacceptable choice" indeed "unthinkable" to decide that non-nuclear countries "must do without this extremely promising energy source—nuclear power—simply because we lack an agreed means to safeguard that power for peace."

No Dividing Line

The "principal culprit" for this turnaround was the "Atoms for Peace" programme, according to Ikle. 'Particularly harmful has been the lack of understanding of the physical realities that would govern diversions of ostensibly peaceful nuclear activities to a weapons programme. Far too much assurance was drawn from the fact information on design of weapons would continue to be kept secret and far too little stress was placed on the dangers of spreading technology and materials for the bombs themselves. This misunderstanding was compounded by the persistence within the U.S. government of a specific piece of misinformation: the claim that plutonium from power reactors was normally not suitable for making bombs. It is not quite clear why so many technically competent people helped to propagate this erroneous notion. It is clear, unhappily, that some used it deliberately to deceive their superiors as to the dangers of plutonium recycling....It was strange — indeed irresponsible — that the engineers and scientists who developed the reactor technology during the 1950s and 1960s so badly neglected the technical factors that could help divide the peaceful from the destructive use of the atom. Little effort was made to analyse this dividing line, let alone to strengthen it. Indeed in some instances, the dividing line was mindlessly weakened. For example, to reprocess spent reactor fuel, the designers chose the Purex method, which had been designed to produce especially pure plutonium -for what purpose? For making bombs. This Purex method was subsequently assiduously distributed by the U.S. Atomic Energy Commission throughout the world. Over 11,000 technical papers were declassified in the proliferation avalanche released by the Atoms for Peace programme."

Thriving Arms Business

I have quoted rather extensively from this article just because it is not some run of the mill academic who has written it but a senior official in the U.S.administration, who moreover states that, 'The research reported in *Swords from Plowshares,* made a most critical contribution towards a more effective policy against proliferation." One would naturally assume from all this that the lessons from the mistakes made in the Atoms for Peace programme had been learnt and were now not likely to be repeated. And one would, naturally, be wrong. After all business is business and there is no business like the arms business. Ask Adnan Khashoggi and Chandraswami if you don't believe me!

The following is mainly taken from a news-report **which appeared in the *Asian Wall Street Journal* of** December 10,1990.

In a crowded hotel room at Oak Ridge in east Tennessee, just outside a federal bomb factory known as Y-12, weapons managers who have spent their lives sworn to secrecy unveil their newest project. By Christmas, they plan to declassify -after 45 years -the membranes used to enrich uranium for hydrogen bombs and license the technology to U.S.companies. The membranes could be used to clean smokestack gases, purify water and filter beer, says James Palmer, the project manager.

These are times of momentous change at the U.S.Energy Department's $9 billion empire of research labs, nuclear reactors, weapons factories and a desert test site dedicated to building nuclear weapons. As the Soviet military threat wanes, scientists and engineers who produced generation after generation of doomsday weapons are offering to help arm U.S.companies technologically against Japanese and German competitors.

No More Sugar Daddy

In showing off technology to makers of cars and computer chips and trying to eliminate whole categories of classification, Energy Department officials hope to do more than simply make U.S. in-

The Eveready Connection

'The environment around Oak Ridge received tremendous abuse form the beginning. Despite the fact that people across the country were developing a greater appreciation and understanding of the environment during the sixties and the seventies, and passing legislation to enforce protection standards, environmental protection at Oak Ridge remained archaic at best."

"When Washington pursued the development of the hydrogen bomb in the early 1950's, Y-12 was chosen as the site for the chemical separation of lithium-6 from the more abundant lithium-7. This lithium isotope separation process required a large amount of mercury. It has been stated that over half of all the mined mercury in the world was at one time in Oak Ridge.The handling of this toxic substance was lax at best. Workers claim that they would at times wade in mercury following spills or leaks. Major mercury spills took place. Three spills of over 100,000 pounds have been revealed with numerous spills over 20,000 pounds. Over two million pounds of mercury remain lost to the environment."

'The Tennessee Department of Health and Environment was aware of some of the environmental problems but was unsure of its enforcement role with respect to a federal government facility. More importantly, operators at Oak Ridge had effectively used "national security"as an intimidating shield which thwarted serious investigation of the facility."

"A 1984 newspaper report disclosed that the Y-12 Plant had lost over 1,700 pounds of weapons grade uranium-235 between 1947 and 1982. This amount would allow for the production of eighty-five atomic bombs. Department of Energy has never publicly accounted for the loss of weapons grade material claiming material inventories are classified."

"The diversity of Y-12 Plant's processes generated large volumes of hazardous and radioactive waste. Inadequate past disposal practices have created serious present day environmental problems. Department of Energy has already spent $ 1 billion cleaning up Y-12 and adjacent facilities and figures it needs another $4 billion to complete the job."

From A Citizen's Guide to Oak Ridge produced by the Oak Ridge Environmental Peace Alliance

The name of the company which has been the operator of most of Oak Ridge facilities including the Y-12 plant since 1947:

None other than the butchers of Bhopal: **Union Carbide.**

dustry more efficient. They say they want to let U.S. researchers trade information more easily. They contend that release of the membrane technology alone might increase U.S. exports by $1 billion per year. And by allowing outsiders to tour parts of Y-12 and other facilities, the officials make another consideration abundantly clear: They desperately need new work. "Sugar Daddy is gone for Y-12," says Albert Stephens, who heads computerized manufacturing at the plant.

The department wants to prove the value of the weapons complex in an age when nuclear weapons production has become less important. Flexible, high precision manufacturing, perfected during decades of bomb making, is the wave of the future for makers of such things as jet planes, engines, machine tools and specialty electronics.

A visit to Y-12 is revealing. At the Alpha One machine shop, which once housed giant magnets for processing uranium, Y-12 managers show off advanced machines and computers used to make and measure parts for nuclear weapons. But most of the shop equipment is hidden behind yellow curtains; so are pallets of finished bomb parts. Workers are nowhere to be seen. The place is library-quiet.

The eerie silence reflects more than secrecy. With the demand for nuclear weapons sagging and environmental problems eating up more of its budget, Y-12 has laid off 11 % of its weapons production workforce during the past one year; employment is down to just 5,855

Undesirable Customers

Weapons based technology, though, could be invaluable to some customers the U.S. would rather shun -Iraq, Libya, Pakistan and other countries trying to build nuclear weapons. Consider the uranium enrichment membranes. These are used to separate uranium-235 from uranium 238. Energy Department intelligence officials say Argentina has tried membrane technology to produce nuclear material, but so far unsuccessfully. The U.S. membranes, which are far more durable than others now available, could help Argentina and other countries make nuclear bombs. So could computerized cutting and assembly tools.

That prospect clearly worries scientists in the weaponscomplex. Los Alamos National Laboratory has produced a 500 page secret document detailing what is needed to make a nuclear weapon and where to buy it, to help experts block sales. 'It's a Sears catalogue of nuclear weapons," says Rodney Thurston, a Los Alamos proliferation expert.

Energy Department officials say the benefits of helping U.S. industry outweighs the risks. For enriching uranium , the membrane technology is outdated anyway, they say; most would-be bomb makers now use centrifuges. And the machine tools are far beyond what a first time bomb maker would need.

Indeed Bryan Siebert, who heads the Energy Department's classification and technology transfer programme, wants to pry the weapons complex open even further. Largely, at his urging, the agency is reviewing nuclear weapons secrecy with a goal of liberalizing the rules by mid-1991.The effort is so controversial, he says, that 90% of the people in classification want to hit me."

Secrecy Interferes with Technology

But he has enlisted powerful allies. One is Dr Edward Teller, the weapon's complex most famous scientist and the father of the hydrogen bomb. Dr. Teller is urging the agency to abandon one category of secrets entirely and to declassify all conceptual information about nuclear weapons that is five years old. "Secrecy doesn't work," he says. "It interferes with the progress of technology."

Now, Y-12 plans to license its technology to any concern that manufactures in the U.S. - a definition that would include most big foreign companies. That proposal enrages Mr Seibert. 'Til keep the Jap. lose out." After 45 years of working on the bomb, he believes that U.S. economy should get some returns for an investment of hundreds of billions of dollars.

False Aura of Profitability

To get back to Mr Ikle and the follies of Atoms for Peace:
"Several misperceptions of the economic aspects of nuclear power also played a role in the spread of weapons capabilities. American reactor manufacturers failed to anticipate that by exporting their technology they would create other exporters that could take future sales away from them. Moreover, the reactor business acquired a false aura of profitability both in the U.S. and in Western Europe, because many of the costs were either borne by the governments or obscured by the size and complexities of large corporations.

The major force behind the Atoms for Peace programme too, was a desire to recover some returns for an investment of billions of dollars into nuclear weapons production, made during the Second World War. The end of the Cold War seems to have provoked precisely the same reaction. As these technologies become more and more widespread, they are bound eventually to find their way sooner or later to not only other nations but also disaffected sub-national groups as well as underworld organisations such as the Mafia. If that prospect gives you the chills, have a glass of ultra-purified water or better still membrane filtered beer, to soothe your nerves. Cheers!

Surendra Gadekar

LETTER BOX

Anumukti Volume 4 Number 2 October/November 1990 arrived in due time informing me to send the subscription for renewal. My views, frankly stated are as follows:
I have no mind to send the subscription money because:
a) I am a lay reader.
b) *Anumukti* is never on time and the excuses for delay sound absolutely hollow. Mere jugglery of words does not serve the purpose.
c) Shri Narayan Desai is nowhere now in *Anumukti* I used to subscribe since Shri Desai used to write off and on in *Anumukti* with his sweet charming easy English giving ample food for thought.

Hari Singh
Jodhpur

I have been followingyour various efforts through *Anumukti.* My best wishes to your efforts and I hope that it will become loud enough to stop the government from pursuing these mad projects in the name of 'progress'.
I am currently working on a social, economic, political model for India. As a prelude to it I had perforce to understand the various facets of our progress in the last forty years to understand how we had managed to create filth and nothing but filth during this period.
In the course of this work I examined the role of technology in the national advancement of the country. I, like every other informed person had fully accepted the benefits of technology to mankind. (Of course one would draw away from its negative and dirty aspects.) What I saw as a result of my study really shook me. I now believe that technology dazzles and blinds even sensible and sensitive people and hence the mad rush towards technology oriented development. It is, therefore,necessary for people to have a **really good look** at what technology does to people and modify their stance accordingly. None of the scientists, however brilliant they may be in their fields, would have the capacity to get out of their deep trenches of learning and expertise and to take a broader look and see the limitations of technology oriented development. India is a beautiful country - has survived a lot of insane leaderships. I am sure we will surface out of the current chaos much sooner than we imagine.

Sri Sankaran
Pondicherry

I am enclosing with this letter an article by Dr A D Damodaran, Director Regional Research Laboratory, which appeared in *Voice of Electricity Workers* a publication of the Electricity Employees Federation of India a trade union affiliated to CITU. This paper was presented in a seminar organised by the Kerala State Electricity Workers Association at Ernakulam with a view to win public support for the proposed nuclear reactor in Kerala.

Notice the zeal with which this CSIR scientist advocates nuclearization. Each of his arguments needs a complete rebuttal. The blind enthusiasm of the author to underplay the hazards of nuclear power and to suppress opposition is extremely conspicuous. Can you do some thing about it in *Anumukti?*

K. Ramchandran
Payyanur

The length ofDrDamodaran'spaper (more than four and a half pages - and that is just the excerpts- prevents us from publishing it in full for a detailed rebuttal. However, most of his arguments are old hat and have been refuted many times previously in Anumukti. I will comment on a few of them since they are nowadays being repeated ad-nauseam by nucleocrats in advertisements.

Other countries have a much larger share of nuclear electricity.
"Europe outside of USSR (an area almost equal to India) has 183 power reactors and also 106 research reactors thus making a total of 209 reactors in all. France has 55 reactors in a country more or less the size of Tamil Nadu.
No comments on his mathematical powers! It could have been a typographical error. Geography, he fails! (Tamil Nadu area is 129,900 sq km while the area of France is 547,033 sq km)
He does not for some reason mention the reactors on the submarines in their waters but they too would be a substantial number - well into hundreds. All these countries got deeper into the nuclear hole faster than we did and now do not know how to get out without a great strain on their economies. But the fact is, that all of them, France included are trying not to get in any deeper. Last year no OECD nation ordered a nuclear reactor with the sole exception of Japan. (See the story on Japanese nuclear power programme in this issue.)

** Nuclear electricity is cheap"
"French electricity which is almost three quarters nuclear is the cheapest in Europe."

The great secret of "cheap' nuclear electricity can be revealed in just two words — hidden subsidies! (See the story on British nuclear costs in this issue). The French electricity board - Electricite du France - has a debt that puts the debt of some Latin American nations to shame. Even its chairman has admitted that last year had been "disastrous" from a financial point of view.*

Demonstrated competence

"With over 70 reactor-years of experience, we are well poised to manage safely these otherwise complex systems."

The US had already accumulated hundreds of reactor-years of experience before the accident at Three Mile Island as had the Russians before Chernobyl. That we haven't had a great big disaster till now is more an indicator of the fact that we have had very little experience. Of these seventy reactor-years nearly ten reactor-years should be deducted since they refer to RAPP-1 which was essentially in a shut down condition. (See the story on RAPP -1 in this issue).

Indian reactors are safer

'Indian reactors have a number of features which make accident conditions highly improbable among them negative power coefficient of reactivity which ensures that the reactor shuts down in case of a power excursion."

It is shameful for a senior scientist like Dr Damodaran to make statements that are factually erroneous. Whether he has done this deliberately or out of sheer ignorance is besides the point The mainstay of the Indian nuclear programme the CANDU type reactors have a positive reactivity coefficient. Thus in case of a loss of coolant during a power excursion the reactor instead of shutting down would produce still grater power causing a Chernobyl type disaster. (See Chernobyl Reactor's Next of Kin in this issue)

No Alternatives

"Be it hydro, be it thermal or be it nuclear there are always groups to protest with a common advice to go for solar wind, wave and minihydro sources, when none of them have been accepted for this role by any nation on earth !"

During just five years, the State of California installed more than 10,000 MW of power from precisely just these sources. 10,000 MW is what the Indian nuclear programme hopes to achieve by the year 2000 A.D. under a fifteen year plan and it is a good bet that it would fail. We do not suffer from a lack of sources of energy : what we do suffer from is a lack of imagination on part of our scientists and technologists who cannot conceive of a source of power which is not centralized and hence under their control.

Public Debates: A Waste of Time

"Public involvement on crucial development issues is a must and is a healthy trend. However this involvement has to be convereted into a constructive methodology, failing which the so-called involvement will only end up in endless debates, qualitative, emotional and many a time even self-defeating. Hence the normal practice in many countries, specifically the advanced ones, is to appoint appropriate bodies consisting of professionals, public men, elected representatives of the people, concerned experts, etc., based on which a policy is announced in the forms of White Papers, which forms action plans about which no more debates are encouraged save exceptional new situations. Unless our Governments start these well tried out practices, we would not be able to undertake any serious developmental programmes.

It is precisely this kind of 'guided democracy' that has made an ecological disaster area out of Eastern Europe and Soviet Union. Professionals have demonstrated a professional ability to pick the just fruits of development for themselves without getting pricked by the thorns ! That is what the debate is all about. Mere lip service to "public involvement in development" will no longer suffice. There has to be a real devolution of power.

NAVAL ACCIDENT

In May 1985, an accident occurrrred in a Soviet nuclear-powered sub-marine at the dock at the Pacific coast settlement of Dunay (also in the Soviet Far East, and 35 miles east of Vladivostok). A letter to the Soviet weekhy magazine "Ogonyok" which describes the accident says that an explosion of the submarine's nuclear power unit caused radioactive contamination of the Amur Gulf, where the submarine was being repaired.

According to another report, from "Information Update" (a bulletin put out by the Pacific Campaign to Disarm the Seas), residents of the area claim that while the sub was being refuelled, the lid of the reactor was forced off prematurely, due either to an explosion and fire or to the reactor starting up accidentally. Several people were killed and the submarine sank at dockside. The dock was so badly contaminated that it is still unusable. It is not known what happened to the submarine, but the radiation has migrated. The contaminated area is about 100 meters wide and 600 meters long. Cleanup of the site has involved removal of 2000 cubic meters of contaminated material to a temporary dump site in the area. Another 200 square meters was cleared away last year. No decision has been made as to final disposal of the contaminated material.

Local residents are continuing their protests. The letter published in "Ogonyok" was signed by 116 residents form Dunay and claims that there are many more cases of similar accidents which have also been covered up. Deputies in the region who have been investigating the accdient have also denounced the military's environmental record, claiming that the temporary site and other waste dumps in the area are neither well protected nor safe. The deputy from Dunay said local people had broken through fences around the area to walk or gather mushrooms. He noted, "We need somebody to protect us from the military."

NOTICE BOARD

Chernobyl Day Event

Citizens for Alternatives to Nuclear Energy (CANE) a Bangalore based antinuclear group is organising a three day workshop on nuclear energy and people's movements on April 26 to April 28, 1991 in Bangalore.

We feel that it would be very useful for the people/groups engaged in questioning the nuclear establishment to get together for a good sharing. We believe that we have a lot to learn from one another. Various groups/individuals are doing much more than what gets communicated to the rest.

In the three days at the workshop we hope to have

- good sharing on our strengths and weaknesses
- critical reflection on the methodologies that we use as public interest movements
- a close look at the threats we face
- learn more about various aspects of nuclear power from scientists
- get to know one another better so that we know where we can draw support from in times of need

We would like each group to be represented by two persons, one who has been taking primary responsibility and another who can step into that position when the need arises. Although we know that it would be difficult for most groups and individuals to meet all the expenses to come to Bangalore, we are unable to offer any subsidy to meet travel costs from our side. In case of dire need, please try and find a local sponsor and also inform us and we too would try to find someone to help partially meet travel expenses. But we would really like that you make your best efforts to come.

Contact Address: K.Krupa
CANE, 809, 17 E Main, Rajaji Nagar, 5th Block
Bangalore 560010,

International Women's Day

BAILANCHO SAAD, a women's group from Goa, is organising a function at Panjim to commemorate International Women's Day on March 8th, 1991. The theme of the function will be "Nuclear Energy and Women" The programme includes two talks by antinuclear women activists and a slide show with slides on Kaiga nuclear power plant.

Rally Against Koodankulam

Murpokku Manavar Sangam and Murpokku Ilaignar Ani, two associations of progressive students and youth held a cycle rally against the Koodankulam nuclear power plant starting from Madras on January 30th, 1991. Their programme included halts and meetings at many places on the way including Vellore, Dharmapuri, Coimbatore, Ramanandapuram and Madurai. They converged on Tirunelveli on 10th of February, where there was a public meeting followed by a cultural programme by Jan Natya Mandali.

T.Sengadir and T.Vinmeen Pandian
Pudu Iyakkam
35 Avvai Nagar
Pondicherry 605008

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> Cowardice asks the question-is it safe ?
> Expediency asks the question-is it politic ?
> Vanity asks the question-is it popular ?
> But Conscience asks the question-is it right ?
> And there comes a time when one must take
> a position that is neither safe, nor politic,
> not popular-but one must take it because it is right.
>
> **Martin Luther King Jr.**

Crossing The Line

The first time I crossed the line was in Boise, Idaho, on a November afternoon in 1971. With nineteen companions, I formed a human chain across Capitol Boulevard, a main thoroughfare in the heart of the city. There were just enough of us to block the boulevard from curb to curb.

Walking into the street that day, into the middle of traffic, I felt alternately foolish and scared. Would my nerve fail at the last minute ? Would I find myself all alone, dodging cars while motorists honked and spectators laughed ? Would blood run on Capitol Boulevard, spilled as a consequence of my rash words ? Would I be arrested, mugged, finger-printed, jailed, given a police record ?

When the first blockader reached the far curb we stopped and turned, facing the oncoming cars. The traffic came to a stop. Our supporters worked their way from car to car, explaining the delay, asking drivers to turn heir lights on if they agreed with us.

We heard honks and yells. Then some lights came on, then more. In a short time officers arrived from the police station, just two blocks away. They moved up and down the line, taking our photographs. Would we be dragged or simply led away ? I wondered when the arrests would begin.

Incredibly, there were no arrests. The police allowed us to continue blocking the boulevard for the remainder of our half-hour vigil, directing traffic into their streets. At exactly 3 o'clock, as a three megaton nuclear blast went off on schedule in far-off Alaska, we trooped off Capitol Boulevard, walking on air, delighted with ourselves at having conducted Idaho's first non-violent civil disobedience action in memory.

I was a forty-five-year-old journalist at the time, married and the father of three sons, editor of a weekly political newspaper, the *Intermountain Observer,* a radical and sometimes strident organ of social protest. We had been at the forefront of social protest in Idaho through the 1960s. On this occasion we were protesting the U.S. Atomic Energy Commission's plan to test an antiballistic missile nuclear warhead off the island of Amchitka in Alaska. It was a project that stirred widespread opposition from environmentalists and peace activists but had just been given the final go-ahead by virtue of a five-to-four decision of the United States Supreme Court.

Throughout the nation there were protest rallies on the day of the test explosion. I Boise the protest took the form of a spontaneous blockade of traffic-a demonstration of outrage that I had proposed and led.

The fear, stress and exhilaration of our stand on Capital Boulevard forged a bond among us. We felt like survivors of an earthquake, a flood, a battle in which we had risked much and won. As newspaper people and political activists many of us already were part of a closely knit group. Three of us comprised the entire paid staff of the *Observer*. Others were VISTA volunteers in the war on poverty, environmentalists, veterans of the civil rights and the antiwar movements. Most of us had standing in Idaho's liberal. Democratic establishment. The Amchitka action, requiring a measure of physical courage and moral certitude surpassing the demands of conventional journalism and politics, gave us a heightened feeling of closeness with each other. It produced a euphoria that proved to be short-lived.

That night, at a social gathering of liberal Democrats, the attorney general of the state of Idaho, a close friend whose election I had helped engineer the previous fall, went into a state of shock when we paused to watch the television news. There, in full view, were the protesters blocking a city street, with the police standing by. The camera zoomed in on his wife, Betsy Park, breaking the law with the whole world watching, while the commentator made pointed reference to her husband, the state's chief legal officer.

Scarcely less shocked or pained was my own wife, Kathleen, who, like Tony Park and some other spouses of the demonstrators, had had no advance notice of the Amchitka action. The demonstration opened a breach between us on the matter of personal risk taking as a form of social action.

But that was just the beginning of the fallout. A few days later the Observer's advertising representative reported wholesale defection in the thin ranks of our business patrons along Main Street. I was surprised by the severity of the backlash.

Even more astonishing to me was the reaction of our principal advertiser, the local CBS radio and television station, KBOI-TV, which also happened to be our owner. When I paid my weekly call on the station's business manager to pick up her advertisement for the next issue, she explained firmly but with some embarrassment, that there would be none. "It's a matter of principle," she said. "I just cannot condone that sort of thing."

A few days later I was called to the desk of KBOI news direct or Dick Eardley, a friend of many years and a popular Boise sportscaster who then served on the city council and was on his way to becoming mayor of the city. Eardley sat me down in the "goldfish bowl," a glassed-in library and conference room used for private conversations.

"Sam, I don't know how to tell you this," he began, half apologetically, "but we have decided to take you off the air." He went on to explain that I had crossed over into an area forbidden to professional journalists. He was sorry about it, and may be he was mistaken, but that was the way it would have to be.

For leading a street demonstrations against the testing of a nuclear bomb on an Alaskan island I had been judged no longer fit for writing, for reporting, for broadcasting at KBOI. How was this violation of journalistic neutrality different from a news director casting a city council vote for a multi-million-dollar downtown shopping mall ? I saw no point in arguing the case with Eardley because the difference was clear to both of us. The difference was in the style and purpose of our activism, not the activism itself. And the message in the goldfish bowl was equally clear : There was no room at KBOI for this kind of activism.

In the newsroom of Boise's most enlightened corporate media outlet, in the liberal business community, on the Democratic Party cocktail circuit, and in my own household I came up against the limits of tolerance in the weeks following my decision to stand in the street with others. I felt the pain of rejection and the gnawing fear of the loosening of career security. But the new ground on to which I had marched or stumbled or strayed felt right to me. I decided to stay there.

The actions of my later years, taken in the company of others, have led to occasional jailing and once to a six-month prison term. Always the feelings have been the same as when I first crossed the line in Boise many years ago. First has come an inner struggle, then a deep fear, then the calm of the action itself, then exhilaration (whatever the outcome), the sometimes painful satisfaction of having, as the Quakers say, "spoken truth to power." Always when I have crossed the line the ground on the other side has felt good.

Sam **Day Jr.**

Source: Crossing the Line
From editor to activist to inmate
- a writer's journey

The temptation of using somebody else's writing for an editorial is something I usually avoid. After all, if I did not have anything to say, what am I doing editing a journal in the first place ? But Sam Day's piece is precisely what I have wanted to say and he says it far better than I am able to. As we gather together on the 5th anniversary of Chernobyl, it is high time that we too cross the line and experience the ground on the other side.

Surendra Gadekar

Mihama Narrowly Escapes Being *Japan's Chernobyl*

On February 9, 1991, one of the steam generator tubes at Mihama Nuclear Power Plant owned by the Kansai Electric Power Company (KEPCO) in Fukui prefecture, ruptured in a double-ended guillotine break causing primary coolant leak to the secondary system and released radioactivity into the environment. Shutdown of the 500 Megawatt Pressurised Water Reactor occurred automatically when the damage to the steam generator activated the Emergency Core Cooling System (ECCS). This is the first time in the history of the Japanese nuclear programme that the ECCS, which is designed to contain nuclear accidents from turning into disaster has been triggered. It is also the first time that a double-ended guillotine break has ever taken place in Japan. Events at the reactor began at 12.40 p.m. when workers noticed that a meter in the control room showed a sudden jump in radioactivity in the secondary cooling system. According to the *New York *Times* they spent the next 50 minutes trying to determine whether or not the meter was providing false readings - a common occurrance at nuclear power plants. Another report from *Associated Press,* says that the technicians simply ignored the warning, because they thought the meter was broken. In the meantime, though, the reactor was heading for potential disaster.

When workers finally realized that tons of mildly radioactive water were pouring into the steam generator, where the water supply is supposed to be uncontaminated, they tried to activate a critical emergency pressure valve. It failed to function. By 1:50 p.m. **a** monitor showed that radiation levels were 1,250 times the normal in the secondary cooling system. At the same time, water pressure in the core dropped drastically and the ECCS kicked, in, shutting down the reactor.

Japan Times reported that, "About 50 to 500 display panels in the control room repeatedly turned off and on. Roaring similar to the sound of jet engines was heard severals times. White puffs of steam were seen outside the reactor. An employees said that this was probably because a safety valve was activated following a pressure increase in the secondary cooling system." The paper said that it was not known why the emergency pressure valve didn't work. If it had, the flow of primary cooling water into the secondary system would have been far less. Reportedly, 20 tonnes of primary coolant poured out into the secondary system.

The owners of the plant KEPCO have traced the cause of the accident to one of the 3,200 metal tubes used to heat secondary cooling water in the steam generator. The tube had been severed, causing the massive leakage of contaminated cooling water. This is the second time that a tube has been completely severed. The North Anna nuclear power plant in the U.S. had the same problem four years ago. The finding has dealt a serious blow to the government and Japanese power company officials who had claimed that any faults in the reactors would be detected during routine inspections. *(Mr Nadkarniplease take note of this.)* (See page 3) According to KEPCO the tube in question had in fact been cleared during an inspection conducted last year.

Engineers who examined the damaged tube found that Engineers who examined the damaged tube found that it had been horizontally severed near the No. 6 metal plate, one of the sin plates supporting all the tubes. The exact cause of the damage has not yet been determined, but they say that the tube may have been dented by the metal plate, which could have swelled from rusting over the years. A swelled metal plate was the major cause of the North Anna problem, but KEPCO officials refused to take that seriously, saying that there was an extremely small probability of such an accident occurring in Japan.

According to experts, the plates, made of carbon steel, are likely to rust when they react with oxygen found in the secondary cooling water, possibly causing the metal tubes to dent. There are ten reactor in Japan - including five operated by KEPCO - currently using the same type of plates.

The reactor, which began operation in 1972, is one of four at the Mihama power station. Its design was based on that originally supplied by the U.S. Corporation, Westinghouse. This is not the first time that it has had problems. Cracks appeared in the piping of the reactor in 1975,1979 and 1983, causing radioactive leaks from the steam generator.

In fact the Mihama power station as a whole has had a rather troubled history, especially its unit-1. That unit, a 340 MW plant, began operation in November 1970, but suspended operation in July 1974 after an accident involving the steam generator. Operation was suspended again in December 1976 after it was disclosed that some fuel rods had broken since March 1973 and KEPCO had been concealing the accident for more than three years. Then on 22nd May, 1981, about three tons of primary coolant leaked, causing serious radioactive contamination to workers. Three employees were splashed directly with the coolant and radioactive gas was released into the atmosphere for over two hours. On 22nd September 1982, the director of this troubled plant tried to kill himself by cutting his throat with a knife.

On March 1st, after persistent public demand, Ministry of International Trade and Industry and KEPCO released a somewhat detailed report on the accident. This report reveals some frightening new facts :

O The main steam isolation valve of the damaged steam generator loop failed to shut when an operator in the control room tried to shut it. The valve was closed manually, seven minutes later by an operator despatched to do the job.

O The ECCS contributed little to the cooling of the core, quite contrary to the first announcements of nuclear officials. Because the pressurizer relief valves were stuck shut, the primary coolant pressure remained high (around 100 kg/cm2), preventing the safety injection of emergency water from the two high pressure injection pumps. The two pumps each had a normal capacity of 159 cubic meters per hour. They had been activated for some 47 minutes but the total amount of water injected was only 30 cubic meters.

O Due to insufficient cooling, the core began to boil for about 15 minutes into the accident, but extensive boiling was narrowly avoided by blowing much steam from the sound steam generator and also some from the damaged steam generator into the air which caused some radiation releases into the air.

O The control room was quite unprepared for the situation caused by both of the two pressurizer relief valves not working. This was outside of the accident scenarios for which the operators have been trained using simulators. They tried in vain for about 24 minutes to open the valves. Then they used the auxiliary pressure spray to depressurize, but since it was not too effective they switched off the High Pressure Injection pumps to reduce the primary system pressure. This act is considered to be a violation of the operation manual and reminds us of the Three Mile Island accident where too judgment of the operator to switch off a similar high pressure pump contributed crucially to the core meltdown.

Based on an article in
WISE News Communique No 347,
and a press release from Citizens' Nuclear

Information Center,Tokyo.

Anumukti4.5

"Nothing to Fear" But...

In our last issue, Anumukti Vol.4 No.4 February / March 1991, we had reprinted an article by Shri Kumar Basu under the heading "Unallayed Fears" which described the could not-careless attitude of the Nuclear Power Corporation regarding problems being encountered with the south end shield of Rajasthan Atomic Power Plant at Rawatbhata. Welt, the original article in The Independent has elicited a rejoinder from Shri G.V. Nadkarny, who is the Director, Environmental and Public Awareness, Nuclear Power Corporation. Now, normally we do not reproduce rejoinders from nucleocrats, since we feel that they have enough resources to be able to put forth their viewpoint before the public without depriving us of precious space. However, we are making an exception for this article since it provides a good footboard to raise many questions that need to be highlighted and is a very good illustration of the hubris that afflicts the nuclear establishment in India. (The comments in bold type are the editors rejoinder to this rejoinder.)

The main objective of the ten-part series titled "Nuclear Power and You" issued recently by Nuclear Power Corporation for public information was to allay any fears regarding nuclear power; more so, given the eagerness of some journalists to come up with sensational articles likely to whip up public fears.

Why is it that the need to "allay fears" regarding nuclear power has only arisen now, more than two decades after the commencement of nuclear power generation in this country ? Have the journalist suddenly become scurrilous sensationalists ? Or is it because with long experience, the total irrelevance of nuclear power to India has started becoming more and more apparent and the harmful effects have now become impossible to hide.

Plant Performance

A case in point is Kumar Basu's article appearing in *The Independent* of February 20,1991. Though the article indicated that the advertisements concealed the greatest dilemma the country encountered regarding abandoning a crippled nuclear power plant or salvaging it by yet to be proved technology, serial number 4 of Nuclear Power and You series did mention the problems regarding the south end shield of RAPS-1 during 1981 to 86 and its restoration to 50 percent of full power since August 1987 as well as the performance of each of the six operating Indian nuclear power plants.

The series of advertisements "Nuclear Power and You" is indeed, aptly named. It does put the interests of nuclear power before it puts you. But for this happy nomenclature, it is an abomination-full of half truths and disinformation. It also contains grave errors of fact, vilfully used to deceive the public. A case in point is the example for nuclear power plant performance mentioned by Shri Nadkaray. Normally, plant performance is measured as a ratio of the power actually delivered in the installed capacity. However, most Indian plants have been subsequently "derated". That is, after a few years of operation and encountering serious problems, the authorities have decided not to run the plant at its full capacity buy at some reduced capacity. (In the case of RAPS-1, this reduction has been from 235 MW to 90 MW-what Shri Nadkarny persists in calling "50 per cent of full power"). The capacity factors mentioned in the ad have been calculated with these derated capacities to make them look somewhat less dismal. However, what takes the cake is the fact that in another advertisement in the same series, while toting up the cumulative nuclear power generation capacities the figures used are of the original (non-derated) capacities. A fine example of having your cake and eating it too!

Nuclear Mindset

Contrary to what the article said, there was no dilemma about abandoning or salvaging RPAS-1. The clear options were implementing repairs to restore it to operation in the short run and planned replacement of the end-shield, at the appropriate time, to extend the unit's life in the long run.

To close down a potentially hazardous reactor is not to abandon it, but rather to not abandon the people (who ought to be the primary concern) to its dangers. The very language of abandonment and salvaging makes one feel that it some broken marriage that Shri Nadkarny is discussing. And his primary attachment is to this piece of junk equipment and not to the people living in the vicinity and not even to the workers who have to face the dangers.

Basu's article raises questions about whether a bigger crack in the end-shield would result in the leakage of light water leading to a loss of coolant phenomena and a consequent catastrophe or if there is continuing apprehension that there could be a catastrophe any time. The answer is no. The light water leakage will be detected immediately and the reactor shut down. Producers have been laid down to handle such an eventuality safely.

Examples abound from all over the world that it is precisely this ("The answer is no.") cocksure attitude-this nuclear mindset - which is the major cause of nuclear disaster. (See the story on Japanese nuclear accident in this issue for another example of the "It can't happen here" syndrome. The belief that pipes would spring detectable leaks before breaks seems good in theory and probably does happen a lot in practice too, but it is not something to bet your life on. Since nucleocrats are betting not their own but their suboridnate's lives this arrogance is likely to continue till comuppence.

Worker Exposure

Also, apprehensions that the workmen involved in the operation may have been exposed to higher doses of radiation are not borne out by facts. By and large, among the workers involved in the end-shield repair work, no one was exposed to individual doses beyond permissible limits and the cumulative doses were also within the limits stipulated for the station.

Would DAE allow outside independent investigators access to medical records of nuclear workers as has been permitted in U.S.A. And what is meant by this by and large ? Does it mean that some workers have received dosages in excess of 'permissible' limits ? These limits themselves are set way too high. For example: the permissible dose limit for nuclear workers is 5 rems/year. Most workers usually are reported to receive around one rem every year. The latest study on cancer risks to nuclear workers (See "Another Nail in the Coffin" page) shows an increased risk even in workers who had received doses of around that much in their entire working lifetime! Also, what about the temporary workers - of whose radiation dosage no records are maintained ?

Organisational Autonomy

The article also states that the "Safety Committee put its foot down and advised a permanent shut down of the unit which it believed could not be repaired. But the DAE prevailed over the Safety Committee." In fact, it was the RAPS operating crew and management which shut down the unit in September 1981, (after the leak in the south end-shield first appeared), on their own, based on the technical specifications and an inbuilt safety culture. There is therefore, no question of the DAE prevailing over the Safety Committee, neither did the Safety Committee advise or instruct RAPS for permanently shutting down the unit.

This is the one point where I am in complete agreement with Shri Nadkarny. NPC, AERB, PPED, Safety Committee, etc. are all non-autonomous organisations under DAE control. To think that they can take an independent stand on anything is rather far-fetched. The Safety Committee could not have put its foot down since it did not have any feet in the first place!

No Compromise on Safety

It is also incorrect to say that in the event of an emergency, the shut down will be hurried and safety precautions not taken and that the NPC, oblivious of future catastrophe is keeping the reactor running, for fear that a power shortage in the state may evoke adverse public reaction. The NPC is fully aware of the implications of operating RAPS-1 and will not compromise on safety. The object of running RAPS-1 is to get maximum mileage and to not deny Rajasthan State Electricity Board the benefit of sizeable amount of power (90 MW) at which the unit can be operated safely, before long term work on the end-shield replacement is taken up. There was certainly no fear of public reaction to power shortages which are quite common in most states in India with demand far outstripping supply.

It is preposterous to suggest that during an emergency, shut down will proceed in a calm unhurried manner. Mistakes will be made and safely precautions overlooked. That is just human nature and not even nucleocrats can change it.

Contrary to the facts put forward by Basu, the end-shield of RAPS-1 were manufactured in India using sub-assemblies received from Canada. On receipt of the end-shields at site, defects were noticed and repaired by welding. Local stress relieving was carried out a site since stress relieving of the entire finished end-shield was impractical.

If the subassemblies were received from Canada, what manufacturing was being done in India ? Another application of our famous screwdriver technology! Also it seems somewhat strange that the defects were not noticed in the subassemblies. Did they not have quality control at each stage of "manufacturing."

The cracks appeared after eight years of operations. The entire issue of the causes of the leaks and the ways of plugging them was discussed in depth with various research units of the government.

Chemical plugging was tried in 1982, and mechanical plugs were used in 1985. Additional cracks in the vulnerable zone caused more leaks and these were closed with additional plugs. This was a time consuming job as the cracks were in inaccessible locations which could be reached only with specially devised remote tooling. All repairs were carried out with the approval of the AERB which stipulated a limit of 50 percent of full power on RAPS-1 operations as abundant caution, considering the stress patterns in the vulnerable zone.

The delay in long term rehabilitation of RAPS-1 is neither due to paucity of funds, nor general apathy of DAE as pointed out in the article, but due only to the complexity of the job and scheduling for appropriate time considering the need to replace to coolant tubes.

The job must indeed be extremely complex if the best "brains" and no paucity of money, it has not even been attempted for the better part of a decade.

End-shield of identical design and material (3.5% nickel steel) have been used at Douglas Point in Canada, RAPS-1 and 2 and MAPS-1. Cracks in the tube sheet have appeared only in RAPS-1. The Douglas Point reactor was not shut down due to end-shield problems. The MAPS-2 end-shield is of stainless steel and all subsequent units have stainless steel integral end-shields. These are not expected to suffer a recurrence of the RAPS-1 end-shield problems.

Finally Basu asks, "Why did the DAE rush ahead to commission similar reactors at RAPS-2, MAPS-1 and MAPS-2, if the performance of the prototype reactor RAPS-1 was not assessed" and assumes that the pronuclear lobby is unwilling to answer. The answer, in fact, has been given since long; the key word of the Indian nuclear power programme being self reliance best suited to our national interest.

Nucleocrats believe that by wrapping themselves in the tricolour and shouting "NATIONAL INTEREST" all questions would automatically disappear. No! Mr Nadkarny. Pray, what national interest was served by not first evaluating the shoddy performance of the post-fact "prototype" before rushing into creating, more such junk. And where has this loudly proclaimed self-reliance suddenly vanished when you are dealing with the Russian and the French for getting crumbs of their technology.

Kumar Basil's reply: My article is based on documents furnished by Department of Atomic Energy and my conversations with members of the Atomic Energy Regulatory Board. Though Nadkarny has claimed that my article is factually incorrect, I would rather believe the DAE version for I have cross-checked it with officials of AERB. It is not I but the AERB officials who have raised apprehensions about a hurried shutdown in the case of an emergency.

Nuclear technology was once described as a Faustian bargain which required a technological priesthood to maintain it. The members of this priesthood would have to be dedicated, pay meticulous attention to every single detail, and be incorruptible. Kumar Basu's reply throws ample light on the dismal condition of our 'atomic age brahmins'. AERB's job is to oversee the safety of all nuclear facilities. If its members think that RAPS-1 poses an unacceptable hazard, they ought to shut it down/pronto. If they feel powerless to do so, they ought to publicly resign and force the issue on the national agenda. However, to raise apprehensions in the public's mind while at the same time doing nothing about the situation is merely a reflection of their own lack of moral courage.

A Healthy Development

Consumer Education and Research Centre (CERC), Ahmedabad has called upon the Centre to inquire into the leakage of radiation from RAPP at Kota and to rehabilitate, compensate and prevent further occurance of such disastrous events.

In a memorandum to Mrs Maneka Gandhi, Minister for Environment and Forests, the CERC has said the leakage of radioactive tritium into the air and water is playing "havoc" with the lives of nearby villagers. Deformed children are being born to otherwise healthy women. According to the memorandum, the Commission of Inquiry should be presided over by a High Court Judge and should include two or three experts of Atomic Energy (not employees of RAPP), representatives, of voluntary organisations, environment action groups, experts from the Pollution Control Board of Rajasthan, radiologists, doctors and experts on radiation therapy for a detailed epidemeological survey.

It has also suggested that a panel to hear grievances and give relief should be constituted and provisions of insurance, medical coverage, payment of compensation towards negligent and indiscriminate disposal of hazardous radioactive water should be arranged for. The present medical facilities should be taken to improve them.

An Example from the Land of Bofors

On March 1st three Plowshares activists entered Swedish Ordinance's armaments factory in Eskilstuna, Sweden where they disarmed with hammers two so-called Carl Gustaf grenade throwers and one AK 5 automatic rifle. Sewdish Ordinance is a major producer of Swedish weapons and the largest share of its production is for export. In particular, the Carl Gustaf grenade thrower is distributed world-wide and was extensively used in the Persian Gulf.

The group, including Stefan Falk, Anders Grip and Per Herngren, calling themselves Armsfactory Plowshares, walked directly in the factory together with the morning shift's workers. To the surprise of the employees, the activists proceeded to disarm the weapons. While they were eventually hindered by the guards, the action was met by workers, guards, and later the police calmly and without any trace of violence. The three were put under arrest, charged with unlawful entry and property damage, and later released. The three are awaiting trial.

On March 2nd and 3rd follow-up civil disobedience actions were carried out by the support group. On Saturday, to the accompaniment of song, theater and a symbolic turning of the earth at the factory fences, four activists - Anders Grip, Per Herngren, Katarina Palmbald and Stellan Vinthagen climbed over the fences and were promptly seized by the guards and later handed over to the police. On Sunday the action continued, this time the group built hotbeds at the fences and were later apprehended by the police while attempting to climb over the fences. On both occasions factory security, the police and the mass media were given exact times for the actions. The four were charged with unlawful entry and damage to the lawns and were later released appending trial.

On March 5th Linus Brohult, Lars Gustafsson and Johan Hammerstedt were tried in Eskilstuna's district court for the March 20th, 1990 Plowshares disarmament of one Carl Gustaf grenade thrower. They are awaiting the court's verdict ....

Another Nail in the Coffin

A major new study at the U.S. Department of Energy's (DOE) Oak Ridge facility has found that workers exposed to even low levels of radiation had higher death rates from cancer than unexposed workers.

The study, published on March 20 1991 in Journal of American Medical Association (JAMA), concluded that the cancer effects of low-dose, slow-delivery radiation were ten times higher than seen in the population exposed by radiation from the Hiroshima and Nagasaki bombs. This lends new credence to the theory that long-term exposure to low levels of radiation is more hazardous than exposure to higher radiation levels in a short period.

According to the study, each rem of radiation exposure accounted for nearly 5% increase in the risk of fatal cancer. Workers at the plant were exposed to an average of only 1.7 rem over the entire course of their careers. Only 638 of the 8318 workers studied received over 5 rem during their careers. Five rem is the permissible annual amount nuclear workers may receive according to Nuclear Regulatory Commission (NRC) radiation standards.

The study included white men who worked at the plant between 1943 and 1972, and followed them through 1984. Earlier studies which covered worker through 1977, did not show cancer increases. The new study said that the excess cancers did not occur until after 1977.

The clear implication of this is that U.S. may be on the verge of seeing proof of increased cancers among all nuclear workers-including ones in the commercial industry. Because the commercial industry newer, cancers among worker would not yet be expected to show up. But the study's results suggest that future studies may be able to identify an increased cancer risk among nuclear workers.

Whether this will translate into evidence of increased risk among residents near nuclear facilities is unknown. The Oak Ridge study focused only on the plant workers, and the increased risk was found to correlate with increased exposure. It is important to note, however, that even the levels the workers were exposed to were quite low. For example, the average 1.7 rem exposure, over a hypothetical 30-year career, equals only about 55 millirems/year additional exposure - only about half as much again as the average background radiation exposure. This level is well below the average exposure level received by commercial nuclear workers.

The study gibes with several other radiation studies, including one conducted in 1977 by Dr Mancuso of workers at the Hanford nuclear facility, and a 1988 study of workers in the British nuclear weapons complex.

Workers at the Oak Ridge plant actually were found to have lower than expected death rates, even from cancer. This is believed to be due to the nature of the study population - well paid white working men, with access to health care and other social benefits. The significance of the study, however, is that within the study group there was a measurable correlation between increased exposure and increased fatal cancer risk.

However, the study did find that deaths from leukaemia were 63% higher than expected - a potentially staggering finding, especially considering that other death rates were lower than expected. However, radiation expert Dr John Goffman cautioned that the methodology and sample size of the leukaemia portion of the study were insufficient to make such an important statement.

Political fallout from the study could include renewed efforts to revise NRC's radiation standards for workers, and perhaps the general public, and even greater opposition to the proposed regulatory relaxation of radiation protection requirements. At the *very least, calls for similar, and ongoing, studies at other nuclear facilities can be expected to increase in frequency in the coming years.

The Department of Energy attempted to downplay the results of the study, but the best its spokesman could manage was to argue that cancer risk is low if doses are low and kept below existing permissible standards.

The study's primary authors were Drs Steve Wing and Carl Shy of the University of North Carolina at Chapel Hill.

The Nuclear Monitor: March-25,1991

Antinuclear Movement in Tartar Republic

One of the most important problems facing the population of the Tartar Autonomous Soviet Socialist Republic is that caused by the building of Tartar Atomic Power Station (TAPS). During this year some actions including demonstrations and marches against the building of TAPS have been held. Recently, Tartar Antinuclear Society has been created. It is the first organisation of this type in USSR. The organisation considers further use of nuclear energy to be absurd! In particular, we are trying to stop the construction of TAPS.

The fifth anniversary of the Chernobyl disaster is a reminder to us that nuclear energy threatens the survival of life on Earth. From year to year we have realised the different kinds of damage that has been caused by this catastrope. The number of sick people affected by radiation has been steadily increasing. This year the necessity to evacuate some more people from their homes has been revealed by the government. For more than three years, hundreds of thousands of people have been living in these regions at grave risk to their lives. The government announced that the damage caused by the accident has cost 10 milliards(billion?) roubles. But this year only Byelorussia has appealed for 17 milliards roubles to mitigate the awful consequences of this accident. It should be noted that the profit from all Soviet nuclear power stations totals just 2.5 milliard roubles. So, are nuclear power stations profitable? Vast areas have been spoilt for many centuries. Because of mismanagement, lot of foodstuffs from dangerous regions were sold to people.

The ruling circles often try to represent the Chernobyl catastroph as some kind of a natural calamity similar to, for example, the earthquake in Armenia. But there is a concrete criminal responsible for Chernobyl: It is the Atomic Energy Ministry. There is an urgent need to stop building any more nuclear power stations as has been done in many other countries. But, despite everything, the building goes on. Academician Velikhov has not abandoned his grandiose plans of atomic construction. Last year two atomic stations at Smolensk have been put to work. By the way, the Atomic Energy Ministry has taken 65 million roubles from the fund collected through voluntary donations from all over the country to help Chernobyl victims, to meet needs of its own.

The Tartar Antinuclear Society stands for alternative development. There are at present in the Tartar Republic and the country as a whole, lots of monopolies that dictate the putting of huge amounts of money into "the great projects" (nuclear power plants, cyclopian channels etc.) The real development of the national economy and the raising of the living standards of ordinary people is restrained by wasteful and uncontrolled use of natural resources. The export of gas and oil, as a result of colonial policy, will in the near future leave the country without strategic raw materials, the government intends to build new giant hydropower stations, *regardless of irretrievable harm done by such dams to nature.

An atomic power station is an especially dangerous object. The damage caused by its operation is enormous. The radioactivity of nuclear wastes is ten million times the activity of the initial nuclear fuel. The radioactive background level unavoidably rises, causing increases in the number of mutations and cancers. The threat of global biological degeneration produced by growing radioactivity becomes daily more real. Nuclear wastes require expensive store houses (burial grounds). Islands in the Pacific have already been turned into radioactive cemeteries for thousands of years.

In our opinion there are two ways to solve the energy problem. The first is to assimilate the energy preserving technologies, for today only about 10% of the produced energy is used effectively. The second is the exploration and elaboration of alternative energy source such as solar and wind power plants. Even in cold Sweden, solar energy has proved to be sufficient for lighting and warming. The Antinuclear Society does not restrict itself only to campaigns against nuclear power stations. We have organised a laboratory for research into alternative energy sources and also to monitor radioactivity in the environment. We also bring out a newspaper and organise conferences. But our main task right now is to stop the building of Tartar and Bashkir nuclear power station. Although the Supreme Soviet of Tartar ASSR has adopted a resolution to this effect, in April 1990, the central nuclear ministry will try to accomplish its plans. Because of this, our organisation together with active workers of Bashkiria intends to carry out a march against both stations on the 5th of July. We appeal to all people in our country and abroad for help in conducting this action.

Albert Garapov
President, Tartar Antinuclear Society
P.O.Box 90 Kazan USSR 420034

The Era of Mild Radium Therapy

The discovery and purification of radium by the Curies in 1898 fascinated the general public and scon became one of the great scientific media events of the 20th century. Here was an element that glowed in the dark and provided a portable and nearly inexhaustible source of powerful roentgen rays. Within a year of its discovery European physiologists were experimenting with radium and its daughter isotopes as treatments for cancer and various skin conditions.

This "Curie therapy" was hailed as a welcome addition to surgery, specially in the treatment of malignancies of the facial and genital regions where radical surgery was difficult, dangerous and disfiguring. Madame Curie won two Noble prizes and her trip to America in 1921 was transformed into a series of whistle-stop photo opportunities, which placed her among the heroes of the new age of technology. By 1927, radium was such an important part of the medical armamentarium that the Welfare Council of New York proudly drew attention to the fact that the hospitals of that city alone possessed more than 12 grammes of radium (worth almost $1 million) and were in the forefront of the development of new techniques in radium therapy. Every important medical school sought to establish a radium treatment center. Treatments were given in private telephone booth-sized cubicles concrete vault. By 1913, radium therapy was a well established medical subspeciality with thousand of patients being treated annually in the U.S. and Europe.

Mild Radium Therapy

Curie-therapy made use of the destructive powers of the beta and gamma emissions of radium and its daughter elements. The penetrating nature of these high-energy emissions made it possible to use sealed radium sources, arranged in fixed geometries within the tumour bed, to sterlize relatively large areas of cancer intested tissue. The dosimetric principles evolved by the early Curie-therapists paved the way for the current use of radiotherapy in cancer treatment.

However, in the early decades of this century another approach to radium therapy also arose which had its roots in the homeopathic and physical medicine movements of the late 19thcentury. Called "mild radium therapy" to differentiate it from the harsh destructive treatments of the cancer physicians, the approach was predicated on the idea that radiation when used in small doses, was a powerful metabolic catalyst.

A Physiological Role for Alpha Particle Radiation

The exact biochemical mechanisms through which radium exerted its salutary effects were hotly debated. Some said that radium compounds worked through direct end-organ stimulation. Others claimed that they worked by the destruction of microscopic toxins. Some others felt that radium worked indirectly by stimulating the adrenals or the thyroid. The only thing that the mild radium therapists agreed on was the physical *phenomenon primarily responsible for these effects; the heretofore ignored alpha particle emissions of the radium nucleus.

Alpha particles are large, relatively slow moving chunks of nuclear matter consisting of two protons and two neutrons. They possess tremendous energy and produce a dense cloud of ionization events when traversingmatter. Because they dissipate their energy so rapidly, they can only penetrate to a depth of 100 mm limiting the range over which they can exert their effects to about 10 cell diameters. This lack of penetration prevented their use in cancer therapy..

The mild radium therapists began with a different philosophic approach. They noted that throughout history, hot springs like those at Brambach in Germany, Ischia in Italy, and Sail-les-Bains in France had been touted as panaceas for a variety of ailments including rheumatism, cretinism, impotence, and melancholy. These salutary effects were achieved only when the waters were drunk or their vapours deeply inhaled. Bottled water from these springs rapidly lost its potency. The great German chemist Justus von Leibig attempted to analyze the waters from Gastein Springs, eventually ascribing their power to a dissolved gas with mysterious electricals effects. In 1903, the discovery was made that the apparent pharmacological agent in these waters was radon ("radium-emanation"), an alpha particle emitting gas with a half life of less than 4 days that was produced in decaying radium. Alpha-particle emitting isotopes, taken internally in minute quantities, were hailed as powerful natural elixirs capable of delivering direct energy transfusions to depleted organs.

The discovery of the tonic effects of radon water can be seen as the beginning of the era of radioactive patent medicines. Mineral water from hot springs had been used for many centuries with no evidence of any ill effects. The theory was that if the active agent in these waters was a radium isotopes, then long term use of small quantities of radium must be harmless as well. Many important European physiologists began to study the cellular and organismal effects of low-level alpha particle radiation. George Wendt in his address to the 13th International Congress of Physiologists in 1929, reported that human leukocytes exposed to low-level radium radiation began migrating toward the radium source and that moribund vitamin deprived rats could be temporarily rejuvenated by exposure to radium.

Radium truly seemed to be the basis for the fountain of youth legends, and because it was considered a natural element rather than a drug, it was available over the counter and was not regulated. By 1913, the parenteral and oral use of low dose of radium was well established in the treatment of rheumatism, gout, syphillis, anamia, epilepsy, multiple sclerosis and other chronic diseases. One physician reported that from 1913 to 1921, he personally had given over 7,000 injections of radium, in doses ranging from 10 to 100 u Ci each. Pharmacopoeias from the 1920s listed dozens of patent medicines that supposedly contained small amounts of radioactive materials. Paradoxically, most of the governmental regulatory intervention in the growing field of radiopharmaceutical nostrums was limited to prosecuting patent medicine manufacturers whose supposedly radioactive preparations were found to give off only background levels of radiation. The discovery in the late 1920s that many young women had worked as radium dial painters were developing bone cancers, sounded a cautionary note to the medical world, but apparently not to the radium devotees who convinced themselves that these problems were due to impurities in the radium paint rather than to the radium itself.

The End of the Era of Radioactive Patent Medicines

The era of radioactive and alpha particle emitting liniments ended abruptly on March 31,1932. On that day a shriveled anaemic patient named Eben MacBurney Byers finally died of multi-system failure, the victim of a mysterious but relentlessly progressive syndrome involving multiple areas of skeletal and soft tissue necrosis, metabolic wasting and bone marrow dyscrasia. *The New York Times* reported the preliminary finding of an investigation into the death under a headline, "Eben M. Byers Dies of Radium Poisoning".

America was at that time in the grip of the Great Depression, and the death of one more poor industrial radium dial worker would not have been front page news. But Byers was a millionaire, an internationally known industrialist, a sportsman and a playboy. He began the final radioactive chapter of his life after falling out of the top berth of a train in 1927 and hurting his arms. Over the next few weeks, he began to complain of chronic musculoskeletal pain and a general run down feeling that was affecting his athletic (and it was rumoured, his sexual) perfomamance. Byers was adviced to try Radithor - a radioactive wonder drug invented in 1925 by the self-proclaimed radium expert William J. A. Bailey of Bailey Radium Laboratories, East Orange, New Jersey.

Byers began drinking several half ounce bottles of Radithor each day from early in 1928 and until October 1930. He claimed to feel invigorated and restored and recommended Radithor enthusiastically to his high-society friends. He sent cases of it to his business partners and girlfriends and even fed it to his racing horses. Radithor was expensive, each bottle costing a dollar, but what was that to the wealthy members of Byer's social set ? The Radithor promotional literature was filled with "testimonials" from great physiologists of the day. And also, Radithor was "absolutely guaranteed harmless".

About two years after he had begun taking Radithor, Buyers told his personal physician that he had lost "that toned up feeling." He began to lose weight and complained of headaches and toothaches. Eventually his teeth began falling out. A radiologist in New York, looked at Byers radiographs and noticed some similarities in the lesions with the descriptions of radium dial painters, Byers' body was slowly decomposing, the result of massive radium intoxication from the Radithor.

Some physicians disagreed. The Radithor that Byers had consumed had contained only tiny amounts of radium, each bottle certified to include microgram quantities of a mixture of "radium and mesothorium in triple distilled water." Many believed that such tiny quantities were innocuous, being cleared from the body before they could accumulate. Radithor was widely used : if it was so dangerous, why had not these effects been reported before?

Since Byers was a millionaire and a prominent citizen, the wheels of the government began to grind. The Federal Trade Commission (FTC) launched an investigation into Radithor and in September 1931. Byers was called to testify. He was too ill to travel and so an attorney, Robert Winn; was sent to his Southampton mansion to take the deposition. He later described the scene:

"A more gruesome experience in a more gorgeous setting would be hard to imagine. We went to Southampton where Byers had a magnificant home. There we discovered him in a condition which beggars description. Young in years and mentally alert, he could hardly speak. His head was swathed in bandages. He had undergone two successive jaw operations and his whole upper jaw excepting his two front teeth and most of his lower jaw had been removed. All the remaining bone tissue of his body was slowly disintegrating and holes were actually forming in his skull."

Byers autopsy revealed that he suffered from the necrosis of the jaw, swollen kidney cortex, cerebral abscess, hyperplastic regenerative bone marrow and bronchopneumonia. His breath, bones and viscera were all highly radioactive; despite the fact that he had taken no Radithor for more than a year.

William J. A. Balley

Attention now focused on the Bailey Radium Laboratories and its founder, head scientist and chief executive officer, William John Aloysius Bailey. Bailey disagreed with the diagnosis of Radithor induced radiation poisoning, declaring, *"I* have drunk more radium water than any man alive, and I have never suffered any ill effects." The next day when health officials tried to obtain further information they found that Bailey had left town.

Bailey's involvement with the pharmaceutical industry began somewhere around 1918. That year he was fined $ 200 plus costs for fraudulently promoting the "Las-I-Go- For-Superb-Manhood' patent medicine. Chemical analysis of these pills which were advertised as a potent aphrodisiac; revealed that the active ingredient was strychnine. Sometime in the early 1920s Bailey became interested in radioactivity and became president of a company called Associated Radium Chemists Inc. This company produced a line of radioactive patent medicines including Arium, a tablet and Linarium a radioactive liniment. Bailey was also listed as the inventor of another brand of radioactive pills, Thorone Tablets, which were marketed as a treatment for sexual impotence.

Among other devices that Bailey invented were the Radioendocrinator, a small readiactive chip that "ionized the endocrine system.'the Bioray, a radioactive paperweight that would supply "a steady flow of gamma rays without any fuss or bother," the Thoronator; a radon water charging device for producing radioactive water in home or office; and the Adrenoray, a cure for impotence that consisted basically of a radioactive belt clip. Some of these devices were sold for as much as $ 1,000 apiece, and all apparently found a ready market in the RoaringTwenties. Bailey later claimed that it was the Great Depression, rather than the Federal Trade Commission, that eventually caused him to get out of the radioactive patent medicine business.

Bailey died of bladder cancer on May 16,1949. He had reached the age of 64, an astonishing feat of longevity for someone who claimed to have consumed more radium water than any living man, it is perhaps ironic that his final contribution to the literature of mild radium therapy came almost two decades after his death, when his bones were exhumed as part of Massachusettes Institute of Technology/Argonne National Laboratory study on radium physiology, his remain revealed extensive radiation changes and were still quite radioactive when studied in 1968.

With the realization that the magnitude of radon problem is greater than had been previously appreciated, interest in the health effects of low-level alpha particle exposure has been rekindled. Some critics have suggested that these radon health risks are being overstead and that low-level long term exposure to this "natural" isotope is unlikely to cause much harm. Before crediting this line of argument, we would do well to review the history of the rise and fall of mild radium therapy in the early decades of this century.

Dr Roger M. Macklis
Excerpts from a paper in JAMA Vol. 264,
(August 1,1990)

News From Kerala

Work is proceeding on a war footing to establish a nuclear power plant at Peringome, about 18 kms eastwards of Payyanur in Kannur district of Kerala. Site selection is presmumed to be almost confirmed and acquisition proposals are on. Simultaneously, the proposed construction of Kakkadavu Irrigation Project, shelved for the past two decades, owing to the public agitation, is being taken up again with the singular objective of providing cooling water to the Peringom power plant. There will not much need for large scale evacuation of people from within the 1.6 km radius 'exclusion zone' since it is at present itself, government owned rocky land. The authorities have been extremely careful in suppressing all information, so that the likelihood of any immediate revolt against the proposal can be averted. Survey work and other activities have been carried out at night and various government departments have already provided vital information, calld for by the nuclear power authorities. This plant is almost certain to materialise, especially as there is positive feedback from a section of the population.

Apart from several villages, highly populated cities and towns with lakhs of people, come within 30 km radius of the proposed plant. *Inspite of this majority of the people seem to be rather indifferent to this nightmarish prospect. People clamouring for so called "development" and "progress" are openly campaigning for the plant with promises of abundant electricity and employment.

We seek your solidarity and support in spearheading a strong movement against the proposed palant. We propose to do hectic campaigning during the next few weeks followed by an antinuclear workshop-camp at Peringome on Chernobyl day. All kinds of audio-visual materials like slides; posters; films and song cassettes will be very useful to us. We seek the presence of all antinuclear enthusiasts in the camp to be held from April 26. There is a great need for resource persons and display material, so that the people can be awakened from their blissful ignorance and complacency. A nuclear power plant should never come up in such a densely populated state as Kerala, where even the International Atomic Energy Agency specifications can never be fulfilled.

We have become active in antinuclear activities again. You may have learnt about the meeting we organised on October 2, 1990 at Kottayam. It was very successful and effective. About a thousand people participated in the programme including some very eminent persons like Dr U. R. Ananthamurthy, the Vice Chancellor of Mahatma Gandhi University.

Kerala Government had continued to maintain perfect silence over the plans regarding the proposed new nuclear power plant in the state. This made us feel that they were dropping the idea as there had been state-wide protest on the issue. New suddenly, after the District Council elections are over and the Left Democratic Front has won a massive success, they are again pressing this idea. Already a state level seminar, in which people like Dr. P. Klyengar and a number of "official scientists" participated; has been conducted at Ernakulam. They have also decided to hold such seminars at all district headquarters in the state.

We too, have started the counter campaign. We feel that right now there is a great need to concertrate on the semi-urban and rural areas of the state. One such corner meeting has already taken place at Kuravilangadu. Two of us Mr. M. J. George and Mr. Jacob spoke there.

Mr. Rajagopal, a very active member of our group and the staff reporter of the daily *Mathrubhumi* was recently given an award for environmental journialism by the State Committee on Science and Technology of the Government of Kerala for his article, "Pollution in Kerala." The award was presented to him at the State Science Congress '91 which was held at Calicut. He received the award and then returned it back to the committee. In his speech, he said, "When our government and science organisation will show integrity by deciding against the installation of the nuclear power plant, he will take the award. We organised a gathering yesterday at Kottayam to accord him a reception.

Now that we have decided to move into the villages, we feel the need for an effective poster exhibition. Any ideas, pictures, cartoons for it would be of great help. Also, have you or anybody else prepared a list of nuclear accidents in India and what is happening to Indian nuclear waste ? Where are they dumping it ?

Abey George
Ayamkudy, P.O. Mathuchiva
Kottayam, Kerala.

REVIEW

The Fire in the Rain
The Democratic Consequences of Chernobyl
Peter Gould
The Johns Hopkins University Press, Baltimore

When the Greek forces finally did overcome the Trojan resistance after resorting to the trick with the "Trojan Horse", they were intoxicated with victory. In their arrogance with their own cleverness, they forgot the Gods who had made it all possible. The Gods punished them by sending storms in the sea in which most of them perished. The Greek word which describes this kind of arrogance -- which leads to ultimate disaster - is hubris.

Peter Gould's book on the democratic consequences of Chernobyl, is a book which describes the hubris of modern civilisation. After successfully wresting the secrets of the atom, modern man is no less intoxicated with cleverness, but disaster awaits.

In many ways, this is indeed a splendid book. It's main theme is the political fallout that followed the radioactive clouds over Europe. How nations with different political systems reacted to this unforeseen threat. How they tried to 'manage' the crisis - the suppression of news; the deceptions practiced by 'experts'; the bureaucratic games played with great skill in the 'democratic' countries like Britain and France and with brute unfeeling force in countries of Eastern Europe, are all there in the book - the various strands gathered by a "shepard" of the intellectual world and presented in a way that brings order and meaning to data and allows lessons to be learnt. Woven into this masterly presentations are technical interludes - in which the author tries to make the subjects of reactor physics and radiation biology intelligible to the lay reader in order to answer the question, "what actually happened at Chernobyl."

These technical interludes are well done - they may not be as authoritative as some others by experts, but they do take the lay reader across the main difficulties likely to be encountered while attempting to make sense out of rads and rems and positive "reactivity co-efficients" and such like. Thus, this book is an important addition to the growing literature on Chernobyl and one that ought to be read widely. It's choice of subject matter, though of vital importance, is one that is not often discussed in other publications.

However, I am unable to give the third full thoroated cheer to the book for it suffers from a serious flaw, - it's last chapter. Peter Gould's dilemma is best put in his own words :

"Chernobyl brought us face to face with a dilemma and if any good may be said to have come from the catastrophe it is the possibility that it has opened the path for reflective thinking once again. The dilemma comes from the fact that it is not easy to think prudently, for the choices are agonizing. We have built a civilisation on energy. Our movements, our food, our communications, our material comforts ...... all require prodigious amounts of energy, and we have fallen into profligate habbits. Even the stability of nations, and therefore the world system made up by them, becomes questionable when energy sources are suddenly placed in jeopardy. If civilisation is to continue to unfold in more humane ways, the energy to fulfil the hopes and necessities of civilised life must be there. The sheer pressure of people on energy resources and a fragile environment lies behind this horn of the dilemma."

Gould's way out of the crisis is the next nuclear chimera - inherently safe reactors. He does not realise that Hiroshims, Bhopal, Chernobyl, the Gulf war,... are all names of the same crisis. The crisis produced by profligate habbits and a way out needs one to reflect on how to give up these habbits. This is a fatal flaw in this otherwise fine book.

Investigator	I have only a few questions.... You were not at the power station at the time, were you?
Director	I wasn't able to be, but I was at the very beginning.
Investigator	Did you realise at once what had happened?
Director	More or less. In general terms.
Investigator	And you left the station?
Director	I, er, temporarily absented myself. You see...
Investigator	I know. Your grandchildren were alone at home.
Director	I saw that work was in hand to extinguish the reactor. My son's mother-in-law lives in a village nearby, eight kilometers away. I thought I'd just dash over to the village, leave my grandsons there and come straight back.
Investigator	But why didn't you alert the whole town? Then they could all have dashed out into the country, even if only, say, five kilometers up-wind. They could have gone that far on foot. It only needed an announcement on the local radio to notify everybody. There was no need for them to wait those twenty-four hours until the official evacuation order was given.
Director	It's not as simple as that.
Investigator	But to put your grandsons into your car and drive away - that was simpler was it? After all, you knew better than anyone else what had happened. Yet children were still playing football in town *this morning.* And freshly picked cucumbers were being brought in and sold on the streets...
Director	I couldn't get back. You know why. They must have told you.
Investigator	Yes - a silly accident. Your car skidded off the road and got stuck on the verge for a quarter of an hour. Fortunately, your grandsons didn't get out of the car. Yes, I know about that. And on the way back you were stopped and detained for a medical check.
Director	I had driven right through the "dirtiest" area of the fallout.

Letter Box

An Invitation to Join Indranet

We feel sure that you are concerned about the mounting turbulence of our present time; the increasing distruction of all life support systems, the spectre of global climatic change, the sharpening communal tensions, the shameless politics, the rapid degeneration of our culture and the hundreds of other problems that beset us. The aftermath of the Gulf War and Bush's agenda for a new "world order" is added cause for alarm, if only because the global arm twisting will be more blatant. Millions of people already pauperized by "modern development" will be further marginalized.

A number of activists and other individuals; concerned with social justice and sustainable development, have expressed the need for urgent action in this critical situation. One of the suggestions was the formation of a network which will provide for mutual support, for access to sources of information and for a forum for discussion.

There is an ancient Indian story that Indra weaved a vital net, with a pearl at each node. Each pearl symbolizes a single individual and each pearl reflects the light received from all the others.

Our aim is to build just such a living network. Each person's contribution, no matter how little can significantly help other individuals and greatly enhance the collective influence. Hence this invitation. We would be happy if you join us as a participant in Indranet.

If you are interested in joining the network, we would like to know more about you personally : your interest, your background, your hopes and fears. We would also appreciate having information on your work and organization, if any, its genesis, its aims, its achievements, the problems it faces, the areas in which you need support or in which you can offer some help or guidance. Others will surely benefit from this information. This information and other suggestions by network members will be published in a newsletter.

The network is being run by Maharashtra Prabodhan Seva Mandal at present, but members willing, could be made independent. There is no membership charge but donations to cover costs of paper and postage and to unable us to reach more people are most welcome. Each individual in an organisation can also be a member. If you agree with what we are doing, do try and get others involved in the network.

Winin Paceica
Maharashtra Prabodhan Seva Mandal
79 Carter Road,
Bandra. Bombay 400050.

You will be happy to know that we had a good meeting on Women's day (March 8, 1991) on the subject of the Kaiga nuclear power plant. Dr. Kusuma came as an invited speaker and there was a slide show and a short video film on the subject of environmental at Kaiga.

We are planning a series of publications on the various nuclear power plants in India which we want to bring out in time for the April 26th conference at Bangalore. The Bookstore is planning to put up a special sale of nuclear related publications at this conference. We already have books on Narora and Shivaji Rao's Silent Killers, etc. and we are preparing booklets on the others, for example Kaiga, Koodankulam and Kalpakkam.

However, we do not have material on Rawatbhata and Kakrapar. The booklets are planned as a mixture of reports, articles and some press clippings on agitations. The purpose is to provide information on the plants to those who might be interested. We believe that the antinuclear stance is hotting up and we must take advantage of this to push if further. Therefore, if anybody has any reports, documents, reports of agitations etc. on Rawatbhata or Kakrapar could these please be rushed over to us.

Mr. Norma Alvaces
The Other India Bookstore
Above Mapusa Clinic,
Mapusa, Goa 403507.

EDITOR'S NOTE :

By the time this issue *of Anumukti* reaches you, it would be rather late for sending material to Ms. Alvares to meet the April 26th deadline. However, I feel that even though these booklets may not be ready in time for the meet, they ought to be published all the same, since they would fulfil a very strongly felt need. Therefore, I would request all *Anumukti* readers to help in this cause.

I am using back issues of *Anumukti* to draft a solidarity resolution highlighting the shared concerns of Bhopal and the antinuclear movement. I think that it is important that we publicize these issues as interconnected.

Also, we are planning an Earthday (22 April) rally in Madras to initiate renewed focus on the Eveready Boycott. (Union Carbide's manufacturing facility is in Madras.) We shall be spending the week before the rally visiting Madras organisations to mobilize participation. There is also a great need to mobilize support in Madras for the protest against both Koodankulam and Kalpakkam.

Kim Laughlin
Eklavya, E-l/209Arera Colony
Bhopal 462016.

Already a lot must have been said about Nuclear Power Corporation's advertisements in *Sanctuary.* Still I want to add my little bit.

The reasons which propel Nuclear Power Corporation to give ads in a magazine like *Sanctuary* can be some of the following:

1. The readers get misinformed and 'follow the line'.
2. The readers get the impression that *Sanctuary* does not hold a view strongly opposed to nuclear power.
3. Nuclear Power Corporation can use *Sanctuary's* name in campaigns of the type "Even these people accept us."

If all these objectives can be unambiguously defeated, I feel there is no harm in taking the ads. Some might doubt if this can be done. I believe that Nuclear Power Corporation's designs can be defeated. If I was to do it, I would :

1. Invite reaction of Anumukti or similar group and print it on the page next to the advertisement.
2. As editor, write a note saying "We oppose nuclear power and also this advertisement campaign which is spreading disinformation... We thank Nuclear Power Corporation for sponsoring this issue in which we plan to expose their hollow claims" (All this should be done after providing prior intimation to NPC.) If even after that, NPC wants to give the ads they ought to be welcomed.

The activists/researchers at times get rather fussy about such issues. One reason may be the fear that a fast buck can corrupt the value system. However if such guidelines are followed while accepting advertisements, this can be prevented. In fact, with such guidelines in operation, chances are that organisations like Nuclear Power Corporation will never give advertisements to magazines like *Sanctuary,* in the first place.

Have you printed any posters? Do you plan to? A3 size posters of two colours can be both effective and affordable. (It would cost around Rs. 2.50? per poster for a print order of 500 posters.) In case there is interest in this, I can take responsibility for sale of posters worth Rs. 200/.

Girish Sant
cIo Dr Kulkarni
Amrita Clinic, Athwale Corner,
745 Deccan Gymkhana
Pune 411004

While travelling in a bus from Jamshedpur, I encountered a very interesting person who works as a machine operator with the Department of Atomic Energy. He is middle-aged and had worked previously at Jaduguda Nowadays, he drills out samples of mineral at various probable sites. At present they are working very close to my village. There are three such sites-Rangamati, Galudih (near Raj Kharsawan) and Sanjay. During our conversation he told me that his son aged about 6 cannot talk and had been examined by doctors at various places including the Tata Memorial Hospitals at Jamshedpur. The Tata Hospital's report mentioned was that the son had a defect in the brain. What struck me was the possibility that the defect in child's brain may have something to do with the radiation absorbed by the father in the course of his work. Therefore, it would be very useful if a sample survey could be conducted in the area to see if there are many other cases amongst the workers involved in nuclear mining. I'll be very happy if I could be of any help in conducting such a survey. I have also noted down the person's name and home address.

Dr Mangal Mahato
School of Physics
University of Hyderabad
Hyderabad 600134

Please accept my felicitation on your excellent editorial 'The Road From Hiroshima" and a very good issue of *Anumukti* Vol.4 No.4. February/March 1991. You have provided good coverage on nuclear issues and problems both within India as well as abroad.

Citizens for Alternatives to Nuclear Energy (CANE) is organising a three days workshop on nuclear energy and people's movements from April 26th to April 28th, 1991 at Bangalore, as you had announced in the last issue of *Anumukti.* In view of national elections, it will be an excellent opportunity if we all meet at Bangalore and make it into a National Convention Against Nuclear Power. It may also be appropriate to prepare a manifesto/resolution' a GREEN Manifesto from Bangalore Convention which will be presented to all political parties and asking the electorate to vote for only those candidates who agree to our demands of a moratorium on nuclear power and nuclear weapons and also agree to provide more funds for non-conventional sources of energy and for the protection of the environment.

Dhirendra Sharma
Committee for a Sane Nuclear Policy -•
M -120, Greator Kailash-I,
New Delhi 110048

My wife and I have been travelling in India to visit our friends and relatives. At Malati Devi Choudhuri's house we came across an impressive copy of your periodical *Anumukti.* Having been involved in providing information questioning the wisdom of building additional nuclear power plants in Britain, we were glad to see the dangers ahead set out clearly.

The size of the construction contracts and the secrecy surrounding semi-military decisions make your task particularly difficult.

Nicholas Gillet
Oakcroft, Cross on the Hill,
Maples. Cheshire SY148DH U.K.

Just today (April 4, 1991) I heard on the B.B.C. radio that there has been an increase in the number of deformed children born in the vicinity of Rajasthan Atomic Power Plant at Rawatbhata. (See "Chernobhata" in *Anumukti* Vol. 3 No.6 June/July, 1990-Editor). British television has shown a film which was secretly made regarding this and the increasing cases of sterility amongst the youth of the area. It also gave reference of some government doctors who refused to say anything probably due to fear of administrative action. All this is definitely the outcome of your hard work and continuing efforts. I feel certain that these efforts shall prove effective and be fruitful.

Rampratap Gupta
Government College, Rampura
District Mandasur M.P.

I learnt from *Janosatta* (Hindi) that a team of doctors and experts from the Bhabha Atomic Research Center had been to Rawatbhata for investigating the very high incidence of diseases over there. Their findings were that the diseases weredue to the ignorance, carelessness and superstition of the villagers. The news item also mentioned the denial to this issued by Shri Ratanlal Gupta, the Sarpanch of Rawatbhata. He said that if this was so, then why have the diseases increased after the opening of the nuclear power plant since ignorance and superstition have been present for ever. It is necessary that an independent investigation of these diseases be carried out quickly. A group known as Socially Active Medicos from Indore has also shown some interest in this but somebody has to take the responsibility of organising it.

Sunil
Kisan Adivasi Sangathan
Kesala, Dist: Hoshangabad M.P.

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ANUMUKTI

A Journal Devoted to Non-Nuclear India

Volume 4 Number 6 June/July 1991

Step by Step into Pluto's Embrace

The Indian atomic energy programme was begun by visionaries, who set their sights high. Nuclear energy was to be that magic talisman which would wipe the tear from every eye, make the deserts blossom and ensure for the country her rightful place in the community of nations. How ever much fault one may now (with hindsight) find with their judgment and with some of the elitist presumptions that underlay that judgment there can be no denying of the fact that these people were indeed visionaries who dared to dream.

The picture, that the whole programme presents today is an altogether different one. Patriotic idealism, comradery, enthusiasm for the challenging tasks ahead are all now well and truly a thing of the past. Gone into oblivion along with the noble dream. Today, visionaries have been replaced by mercenaries; who dare not dream but only scheme. The whole accent is: make your pile while the going remains good.

One of the latest examples of this selfish, short-sighted and profoundly anti-people attitude is the proposal by the Atomic Energy Commission to accept spent nuclear fuel from other countries for reprocessing here. Seen from the nucleocrat's point of view this proposal has some attractive features. Presumably, it will earn some foreign exchange and in our present desperate state this carrot alone will make the political leaders' mouths water and be sufficient to obtain their consent. Secondly, it will present an occasion to tom-tom their own 'great' achievements — how India is only the fifth or maybe the eighth country in the whole world able to master this 'complicated' technology. And thirdly, the proposal neatly covers up the fact that there is today an idle overcapacity in the country as a result of past mistakes in planning.

What the whole operation would involve is the transport of radioactive wastes from research reactors in other countries to India, the separation of plutonium from these wastes over here and the reshipment of the separated plutonium and the residual solidified wastes back to the country of origin. The dangers involved are many: First and foremost is the risk of theft: Just two kilograms of separated plutonium in a bomb can cause massive destruction and thus these shipments to and fro would be a great attraction to all kinds of terrorist groups. Second, is the risk to ordinary citizens posed by those trying to safeguard against the thefts: While the disaffected groups may or may not attempt nuclear dacoity, the police and paramilitary apparatus of the state is certain to attempt a major robbery — erosion of the civil rights of the citizen — all in the name of providing 'nuclear proof security. There would be an exponential rise both in the size of the coercive state apparatus as well as in the draconian and arbitrary powers it would assume for itself..

Third is the risk, nay the certainty, of environmental damage. Reprocessing plants are bigger polluters than nuclear power plants, since the work involves mechanically and chemically breaking up spent fuel rods and thus releasing most of the volatile radioactive nuclides trapped inside. Large amounts of highly radioactive liquid wastes are produced during the process. Other countries doing reprocessing have ail found difficulty in managing these wastes and areas around reprocessing plants in different parts of the world, whether in U.S.A., Russia or U.K. are all badly polluted. (See "Back to the Land" on page 5 of this issue.)

Last is the risk posed by nuclear transport of materials over potholed roads and under the prevailing driving conditions, about which senior nucleocrats including two former chairmen (H.N.Sethna and Raja Ramanna) had this to say just seven years ago in a paper presented at an international symposium in Vienna:

"Economic considerations would warrant a large-capacity fuel-reprocessing plant, centrally located, along with the required radioactive waste management capability. But in a highly populated, developing country such as India, the logistical constraints, in terms of an adequate transportation network of suitable standards and other infrastructural requirements need to be reckoned with. For instance, movement of irradiated fuel over railways can pose a problem as the track-widths adopted varies along the route. Similarly use of roadways could be cumbersome, as in certain areas the load bearing capacity of the existing roads is inadequate for the carriage of heavily shielded consignments."

What one would like to ask these worthies and their successors is; in what way has the infrastructural difficulties eased over the last seven years for them to contemplate large-scale transport of radioactive waste products all over the land? Have the roads become any better today? Or have the drivers become suddenly less accident prone?

Reprocessing of spent fuel is done in Trombay and at Tarapur while another plant at Kalpakkam is almost ready. The earlier hare-brain notion of having a reprocessing plant each at all nuclear power plant sites has apparently now been given a quiet burial. Since the nucleocrats are determined to provide the 'benefits' of nuclear energy in the concrete form of nuclear power stations to all parts of the country, that would have essentially meant sacrificing vast areas to waste. However, the new strategy of moving radioactive waste around is certainly no improvement. And to be moving not only our own waste but that of foreigners as well for little bits of money just indicates complete intellectual as well as moral bankruptcy.

Plutonium is an aptly named material. Pluto is the king of the underworld. Over the last forty years we have been slowly but inexorably marching towards his kingdom. Our goals have become ever more modest, our sights have been fixed lower and lower as befits a nether world people. One can almost predict the next proposal that our nucleocrats will come up with. A few years further down the road with the foreign exchange position even more precarious they would solve the hitherto insoluble nuclear waste problem. After all, West - the repository of all the good things of life including nucleocrats' children - should not have to deal with this problem at all. What are we for! India has vast land areas and stable geological formations where all this waste could be safely stored forever, as long as that precious foreign exchange keeps trickling in.

Surendra Gadekar

Anumukti deeply regrets the sudden and untimely demise of Shri Bhaidas Parikh, a member of the Gujarat Anu Urja Jagruti and a staunch friend of Anumukti. His calm presense, sage advice and unstinting help in times of need were a great support to us all. His absence would be keenly felt.

The Beginning in Bangalore

Antinuclear groups in India have been somewhat like the village republics of old — independent, self reliant and isolated from each other. The three day workshop from April 26 to April 28,1991 held at the premises of the Indian Social Institute and organised by Citizens for Alternatives to Nuclear Energy (CANE) group was an attempt to braid the various strands together. There is no doubt at all that the organisers' hard work was crowned with success. All participants at the end of the three days felt closer to each other, and part of a nation-wide movement. Many new friendships have been forged, contacts established, concrete proposals of mutual help put forward. All these would be of great help in the days ahead in finally halting the nuclear steamroller from stumbling on.

More than sixty participants came from different parts of the country. Besides Karnataka; Goa, Gujarat, Kerala and West Bengal were well represented. There were also some friends from Tamilnadu, Bombay, Orissa and Delhi. The absence of representatives from around Rawatbhata, Jaduguda and Narora was most keenly felt. The imminence of general elections prevented groups from Andhra Pradesh from attending which too was a great pity.

Not only did the participants come from very different backgrounds, they also had very divergent expectations from the meeting. These ranged the whole gamut from, "How this meeting can help to close down Kaiga," and "What can be done to build a model alternative;" to "Can nuclear energy be used for good purposes without hazards in the Indian context. However, by and large, the expectations of the participants could be divided into four broad categories:

- Strengthening contacts
- Exchanging information and sources of information
- Bringing nuclear energy to the forefront as a live public issue
- Gettingbetter educated about the nuclear issues as well as about alternatives

The organisers tried to satisfy all these expectations by keeping the programme schedule rather flexible and by breaking up the gathering into a number of small groups so that all would have a chance for self-fulfillment and expression. The only sacrosanct timings were the meal times, so that the workers who prepared and served the meals would not be inconvenienced. An example of the flexibility and accommodating nature of the organisers was forthcoming even before the meet formally began; since a number of participants expressed a desire for some form of direct action to mark Chernobyl day, the organisers scrapped the scheduled programme. The first afternoon and the evening were spent in taking out a protest march from the venue of the conference to the offices of the Nuclear Power Corporation. The rally ended by presenting a short memorandum to the officials present there exhorting them to join the movement and save the world from a repetition of the Chernobyl horror. Needless to say, these worthies remained unmoved! Afterwards there was a street play performed by participants from Uttar Kannada.

The meeting was formally inaugurated by a retired justice of the Karnataka High Court, Justice Nittu Srinivas Rao. The first morning was spent in getting acquainted and in to analyzing the various strategies and actions used by different groups in trying to raise awareness among various special interest groups such as for example students and legislators and lawyers.

The first programme on the second day was a talk by Prof D.K.Subramanium of the Indian Institute of Science. Prof Subramanium gave a very fascinating description of the vast scope available in India regarding energy conservation and how by being more efficient India could eliminate the need to develop most conventional new sources be they coal, oil or nuclear.

This talk was followed by an information exchange session with the participants breaking into three groups; one on nuclear energy, the other on movement strategies and a third on alternatives.

The afternoon session was spent by various groups in conducting a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of their own movements and then reporting the results to the plenary. The rest of the afternoon and evening was taken up by a 'media strategy' session. In this session each group presented their most effective programme to raise public awareness. These comprised of poetry, drama, talks, slideshows and dance. This session was extremely useful since it allowed different groups to open up and share their talents and thus come closer together.

One of the major shortcomings of the meet was that it did not provide enough time for various groups to talk together — a lot of time was spent in talking within groups. Many complained during the evaluation on the last day that had discussion been more structured, it would have been more beneficial. The organisers had expected this give and take between groups to take place informally during free times. This did happen a lot and yet there was dissatisfaction on this score—another indication of the extent of earlier isolation amongst the various groups and their keenness to pool their strengths together.

After dinner times were meant for slide-shows and video presentations. First evening, there was an extremely animated discussion which lasted till past mid-night following a slide presentation on the condition of the people around Rawatbhata and the screening of a video film, 'The Price of Power," dealing with the same subject. The second night there was a slide show by Nagesh Hegde on nuclear power followed by films on the Narmada movement, "Save Water—Save Life March," and on the Indian Rare Earths plant at Alwaye in Kerala.

The last day was occupied fully in forming plans for the future. There was great interest in closer cooperation and there were many suggestions made for achieving it.

Some of the proposals which elicited a great deal of discussion were:

- Making antinuclear movement a strongly women's oriented movement:
  Since nuclear energy is a direct threat to a woman's right to motherhood and having healthy children, some participants felt that the movement should have a women's oriented focus. Not everyone (not all of them men) agreed with this emphasis. However, there was general agreement that special efforts were needed to raise awareness amongst women. In this connection Dr Kusuma (Contact address: Snehakunja, Kasarkod, Taluka Honnavar, Dist: Uttara Kannada, Karnataka) agreed to be a focal point of a women's action programme.

- Collecting reliable data on the health effects of Indian nuclear power stations:
  One of the major shortcomings of the antinuclear movement in India has been the almost total dependence on foreign data The need to generate an Indian data base was strongly felt and expressed by many. As a first step in this direction it was decided to hold a proper study of the health condition of the people living in the vicinity of Rajasthan Atomic Power Plant at Rawatbhata. A preliminary meeting to decide upon the methodology of the study was scheduled in Bombay on the 15th and 16th of June.

- Raising public awareness:
  Suggestions included taking delegations of neighbours of proposed sites of nuclear power plants to Rawatbhata, so that they could see and experience for themselves the kind of havoc even 'safely' operating nuclear power stations cause in their immediate vicinity. There were demands that the slides and pictures of the people around Rawatbhata, be made available to each group so that they could be widely displayed. (In this connection the Anumukti group has already distributed five sets of slides to different groups from various parts of the country.) The need to conduct local workshops in small towns near nuclear power stations was also widely expressed. There was a suggestion that dates like the Hiroshima-day and the Chernobyl-day be specifically reserved for such local activities by activists and national level programmes be taken up during other times. Another proposal which had a great deal of support was for simultaneous cycle marches to Kaiga by various antinuclear groups from different parts of the country. However the logistics of these need to be worked out.

- **Better intercommunications:**
  How to achieve better communications between various groups took up a lot of time. It was decided that this task be divided into two. Coordination between various groups would be the responsibility of CANE while information exchange be conducted through *Anumukti*. *Anumukti* should publish a proposed date of publication of the next issue and a last date for receiving communications. There should be a separate column in *Anumukti* for such group communications.

- **Available Resources:**
  Claude Alvares from the Goa group said that they had facilities for publishing books in English. They were already bringing out small booklets on various nuclear power plants and would like to make that an ongoing project. They also had an assured distribution network. The Gujarat group said that in Sampoorna Kranti Vidyalaya at Vedchhi, they had **a** very good training centre where young activists could come for short times to get trained both in nuclear issues as well as in non-violent forms of protest. Participants also wanted a list of all the resource material whether they be books, papers, slides, films, or videos available with all the groups in the country. Satish (Contact Address: CISEC, Kottamukku, Quillon-13 Kerala)agreed to compile such a list and to send it to the various groups on request. It was also decided to make a common slide show comprising a selection from Nagesh Hegde's slides on nuclear energy, the *Anumukti* groups slides on the health condition of people around Rajasthan Atomic

Power Plant and the Kerala groups slides on the health effects on people living in high-background radiation zone in Kerala.

- Liaison with other movements
  One point of total unanimity was the realization that nuclear power plants are just one head of a many headed monster called 'development', and regarding the need to fight this monster on many fronts. One example was provided by the group from Goa who said that the greatest threat to the social fabric and the environment of Goa was from the depredations caused by modern tourism with its five star hotels and luxury holiday resorts. Groups in Goa plan to use the nearness of the Kaiga nuclear power plant as a means to discourage tourists from coming to Goa.

The concluding function of the meet was a public meeting in Gandhi Bhavan at which a retired chief justice of the Karnataka High Court, Justice D M Chandrashekhar, presided.

Back to the Land:

The Sea-to-Land Transfer of Radioactive Pollution

While the British nuclear lobby have ceased to deny that they have made the seas around Britain the most radioactive in the world, they continue to insist that this is having no impact on the health of those who live or work on or near the sea. But research by the nuclear industry into the effects of the marine discharge of man-made radioactivity has been characterized by the use of inefficient technologies and mischosen sites for monitoring and analysis, and has been undertaken against a background of basic ignorance about the behaviour of radioactivity in the sea.

For some forty years, the British government has turned logic on its head and allowed the nuclear industry to discharge radioactivity into the sea in complete ignorance of its consequences. The little knowledge that has been acquired about the dilution and dispersal of radioactivity in the sea has been gained only by monitoring the radioactivity after it has been discharged.

High incidence of childhood leukaemia found near the coastal nuclear plants at Sellafield, Dounreay and Hinkley Point have been linked to the radioactive discharges from these sites. But the link is by no means clear cut; indeed if *conventional* dose-risk estimates are used, the *reported* levels of radioactivity released from these plants could not be responsible for the leukaemias. However, the conclusive epidemiological studies of these leukaemia clusters rely on absolutely sound data. There needs to be a definite understanding of the dose-risk estimates, the amount of radioactivity entering the sea and the behaviour of radioactivity in the marine environment, as well as an efficient programme of monitoring. Unfortunately, none of these conditions are being fulfilled.

Understanding the Marine Environment

To understand the dispersal and dilution of radioactivity in the coastal waters there must be a thorough knowledge of the system of currents in the relevant sea areas. Yet the definitive *Atlas of the Seas around the British Isles,* admits that for all British waters "the main overall weakness in the study of water column movement is the lack of systematic, long term data collection in almost all areas." For the Irish Sea, this lack of data means that the authors can say no more than "it would appear that more often than not there is a South to North flow to the West of Isle of Man." For the region in the vicinity of the nuclear installations at Sellafield, Chapelcross, Springfields, Capenhurst and Heysham this definitive work says "the circulation shown for the region is still a matter for argument."

Knowledge of the residence time of the pollutants in any given sea area is similarly vague. According to the International Council for the Exploration of the Seas, the fate of pollutants is dependent on the environmental conditions at the time of the release and for a few months afterwards. The large variables of wind, current and even river input spread over extended time periods, makes estimates of residence times extremely unreliable.

After a large leak of radioactive crud into the Irish Sea from the Sellafield pipelines in 1983, site operators British Nuclear Fuels admitted that nothing was known about how the radioactivity was likely to disperse. Irish Sea Project, an independent research group conducted a number of studies to test the

Reprocessing

At the moment a reactor is shut down its spent fuel contains some 450 synthetically produced nuclides, including plutonium-239. The method for chemically separating this plutonium-239 from uranium and its fission by-products is known as reprocessing. These methods were originally developed during World War II to provide highly purified plutonium for atomic bombs.

Uranium, neptunium and plutonium are members of a series known as the actinide series of elements. Their chemical properties are similar to the lanthanide series of rare-earth elements. Early studies revealed that plutonium had chemical properties that varied with its oxidation state and could thus be exploited for separation processes. These properties included the solubility of plutonium phosphates and fluorides in aqueous solutions (compared with the insolubility of the phosphates and fluorides of the fission products) and the fact that certain plutonium ions could be extracted with organic solvents.

The fission products are isotopes of elements ranging in atomic number from 30 (zinc) to *66* (dysprosium). Most of them are radioactive with half-lives that range from less than a second to thousands of years. The fission products are the chief source of heat and radiation from spent fuel. A dozen or so combine intense radiation and long half-life with chemical and physical properties that are troublesome in reprocessing or in the ultimate disposal of the wastes.

The first step in the treatment of spent fuel is to store it for several months in water filled pools at the nuclear power station. During this period the radioactivity and the evolution of heat decrease by a factor of about 10,000. The uranium oxide elements that fuel power reactors are encased in long, slender tubes, made of either stainless steel or of an alloy of zirconium called Zircalloy. Such rods are prepared for processing by chopping the tubes into short sections and dissolving out the oxide ("chop-leach.")

The "Purex" process, which is the most commonly used reprocessing method all over the world, employs TBP (tributyl phosphate) dissolved in a kerosene like hydrocarbon as the separating agent. When uranium and plutonium ions are highly oxidized they are more soluble in the TBP solution than they are in an aqueous solution. Under the same conditions hundreds of fission products are more soluble in a strongly acid aqueous solution than in the organic one. The process involves making the aqueous and organic solutions to flow in opposite directions through a column or some other kind of a mixing chamber that disperses one of the solutions in small droplets through the other. Thus the solvent can extract uranium and plutonium in their highly oxidized forms from the aqueous feed solution which contains most of the fission products. In separating the plutonium from the uranium, the plutonium is reduced to its trivalent form making it insoluble in the solvent which then contains all the uranium.

potential movement of water column and its associated radioactivity. These studies showed that the radioactivity released could travel further and faster in the sea than had been previously guessed, and that such radioactivity might concentrate and remain in coherent masses over a period of months. These coherent masses could be trapped in certain types of coastal locations for even longer periods.

Incomplete Discharge Data

Ministry of Agriculture, Forests and Fisheries regularly publishes an *Aquatic Environment Monitoring Report,* which contains what purports to be a definitive list of the discharges of liquid radioactive waste from UK nuclear establishments. This data is far from complete.

It is inevitable that sites as complex as nuclear establishments will suffer from accidental leaks. The 1983 pipeline leak was only discovered because Greenpeace protesters were working off the end of the pipeline. BNF was able to make only approximate assessment of the radioactive contents of the leak. BNF was also unable to deny that there had been such incidents in the past.

BNF also discharges solid radioactive wastes into the Irish Sea including pieces of contaminated work gloves, bits of highly radioactive bitumen, and particles of radioactive stainless steel from nuclear fuel pins or reactor cores. Since the dumping of solid wastes into the marine environment is currently subject to a moratorium, there is no official record of these wastes.

In February 1979, a serious leak of radioactivity was discovered at Hinkley Point, Somerset. This was escaping via a site drain which was inspected only once every six months. The authorities guessed that the leak might have begun on the 8th or perhaps the 17th of January. Incidents of this nature occur every year at British nuclear establishments, and because of bad site design and lax attitudes to on-site and pipeline monitoring, it is almost always impossible to obtain information on the duration and radioactivity content of the leaks.

Other contributors to man-made marine radioactivity are radioactive cargoes lost at sea, as well as nuclear-powered warships that routinely discharge at least six nuclides in significant quantities. There are also "non-nuclear" sites that produce radioactive waste by-products which are flushed into the sea.

Plutonium-241

Plutonium-241, a beta emitting radionuclide, was originally thought to be unimportant in terms of human radiobiology and was consequently discharged into the sea in unlimited and unqualified amounts. It is "guesstimated" that, up to the end of 1982, some 550,000 curies of this substance had been discharged from the Sellafield pipeline alone. It is now accepted that plutonium-241 presents a risk to human health in its own right, and, more seriously, plutonium-241 decays to produce americium-241 which is both a beta and an alpha emitter. Americium-241 is considered to be 2.5 times more hazardous than even the most dangerous of the Plutoniums. Americium accumulates in marine sediments and silts and in living organisms. It is particularly prone to being incorporated into seaspray and so transferred back to the land.

British Nuclear Fuels has paid compensation to the dependents of two former radiation workers who died of cancer. The payments were announced in a joint statement issued by British Nuclear Fuels Ltd. and the General Municipal Boilermakers and Allied Trades Union. In one case a payment of just over £ 21,000 was made to the dependents of a former employee at Sellafield, who died of lung cancer in 1976. No details of the other case have been released at the request of the dependents.
Source: **atom:** *Journal of United Kingdom Atomic Energy Authority (March 1991)*

Limits have now been imposed upon discharges of both plutonium-241 and americium-241. in 1988, for example, the total discharge of americium (including that due to plutonium-241 decay) was around 45.5 curies. In comparison it is estimated that americium production in Irish Sea silts resulting from the decay of historically discharged plutonium-241 will peak towards the end of 21st century, by which time plutonium decay will be contributing approximately 1,300 curies a year into the Irish Sea.

Behaviour of Marine Radioactivity

The two nuclides which make up the greatest percentage of discharges from reprocessing sites are tritium and caesium. They both dissolve and become evenly distributed into a water-body. This "diluted and dispersed" radioactivity is reconcentrated in the marine environment by a number of mechanisms. Human body absorbs 100 percent of the tritium in water through the skin, and 100 percent of the tritium in water or water vapour is inhaled. Tritium reconcentrates in the human body, particularly in the fat cells. In laboratory studies on animals, it has been shown to cause an increase in lymphosarcomas, as well as an important level of incorporation into DNA, RNA and proteins. Tritium is difficult and expensive to monitor in environmental samples so the regulatory authorities do not take up such monitoring.

Caesium on the other hand is easy and cheap to monitor. Like tritium it is ubiquitous throughout the marine environment which it has entered as a result of weapons test fallout, and accidents and gaseous and liquid discharges from nuclear plants. Monitoring by the authorities and independent groups has proved that caesium reconcentrates in the marine food chain and in estuarine and marine sediments, and blows ashore with seaspray and water vapour. Caesium from the sea can be found in the grass and lichens at least 10 miles inland in South Wales and even more in Cumbria. Caesium reconcentrates in the muscle tissue and reproductive organs of marine and land mammals, and is transferred via mother's milk to offspring (who prior to weaning show much higher body burdens of caesium despite their shorter exposure time.)

Sediment Behaviour

All nuclear installations discharge alpha emitting radionuclides of the actinide series—the plutoniums, americium and curium. Sellafield makes the major contribution to the British waters and its signature can be detected as far away as Scandinavia.

Since actinides are heavy elements it was originally assumed that they would settle and would be trapped in the sediments off the end of the discharge pipelines. However, in a 1977 enquiry, it emerged that the contaminated sediments off the end of the discharge pipelines were subject to a host of phenomena including dredging, trawling, earthquakes (several in the Irish Sea over recent years)and storms. By 1989, the responsible authorities had only just begun to construct models of marine sediment movements; models which do not include any input for specific storms, but only for an "average effect."

The averaging of such data irons out the peaks of radioactivity in the environment. Such a peak occurred in February 1990, when extreme storm conditions breached sea defences and deposited hundreds of tonnes of marine sediment in the streets and houses of the town of Towyn in North Wales. Of the fourteen samples of this sediment analysed for radioactivity , eight contained Sellafield derived actinides at levels which exceeded by more than ten times the official levels at which further investigation is required. This event has certainly led to the inhalation and also ingestion of actinides. Yet, as far as the official data-gatherers are concerned, it remains unrecorded.

Microlayers and Aerosoling

As the liquid waste from nuclear installations tends to be warmer than the ambient sea temperature, discharge plumes tend to rise towards the sea surface. The plumes contents are therefore available for incorporation into the sea surface "microlayer." The microlayering phenomenon occurs when the sea surface layer, only thousandths of a millimetre thick, becomes enriched with very fine sedimentary material. When the sedimentary particles are exposed to radioactive contamination, the microlayer concentrates the surrounding levels of radioactivity. Irish Sea microlayers, for instance, have been observed to be enriched with plutonium and americium by factors of four to five.

Microlayers themselves cause a second set of phenomena called "aerosoling," which allows for the transfer of radioactive materials from the sea to the air by a number of mechanisms including bubbling, evaporation, and wave break in the open sea and in the surf line. Seawater-to-air aerosoling enrichment factors are enormous. The breaking of waves along the shoreline has been observed to produce aerosols with an enrichment factor of 812 for americium.

Silt Monitoring

If there is no understanding of the dispersal patterns of man-made radioactivity in the sea, then there can be no proper assessment of where to monitor.

The village of Garlieston is the only official monitoring site on the coastline of Wigtownshire in South West Scotland. It is on the evidence of this *one* site that conclusions are drawn about the effect of radioactivity on the population of over 120 miles of coastline. Samples taken from silt deposits in the Cree estuary by the environmental group Radioactive Survey for the People of Wigtownshire, gave a maximum reading for americium of 715 becquerels per kilogram. The maximum activity for the same nuclide a few miles away in the stony-bottomed harbour at Garlieston was only 40.5 Bq/kg. A similar pattern was noted for plutonium and caesium.

It is therefore likely that some people on the Wigtownshire coast have for many years been exposed to much higher levels of radioactivity than official reports indicate. Despite being fully aware of both the Cree/Garlieston discrepancy and evidence from the Institute of Oceanographic Science that estuaries and mudflats are likely to have the highest marine radioactivity levels, the authorities have failed to adjust their monitoring practices.

> *There is no doubt that the very high concentration of man-made radiation in estuaries is a significant source of sea-to-land transfer. Yet, none of the UK studies of sea-to-land transfer are conducted near the silts of estuarine headwaters.*

Monitoring of Sea-to-Land Transfer

Most of the UK Atomic Energy Authority's (UKAEA) research on sea-to-land transfer of actinides has relied on the use of continuous high volume air samplers and muslin screens. Both the technology and the methodology are deeply flawed.

The muslin screens are usually deployed to catch airborne particles on or near the surfline of open coasts. The high volume samplers, which draw air through an aperture positioned one metre above ground level, are sited inland of the screens. Because of the many inaccuracies inherent in the use of muslin screens (especially in winds above force five, when the material in the screen stretches and its porosity increases) a 1982 UKAEA report concluded that they should be used "only as a qualitative tool to compare relative concentrations of actinides in seaspray."

Despite this warning muslin screens have been used repeatedly in recent studies by UKAEA into human exposure by inhalation to actinides coming off the Irish Sea.

Muslin screens were first used in the early 1980s because the high volume air samplers are "not properly suited" to sea-to-land transfer studies, "and are believed to be not very efficient for relatively large particles" which may be found in seaspray. Yet, the UKAEA responds to criticism over the use of muslin screens by arguing that the results from the screens are supported by the use of the high volume air samplers.

Inland Penetration of Radioactivity

There is ample evidence that seaborne radioactivity is penetrating inland and entering the human food chain. Independent analysis have repeatedly confirmed that caesium-137 from Sellafield sea discharges on pasture grass and tree lichens more than ten miles from the coast. A pre-Chernobyl study from the Hebridian island of Uist showed that caesium-137 was present in almost every type of island produced food.

The population of the coastal zone is breathing in potentially significant doses of radioactivity particularly in periods of strong winds.

In spite of the evidence that this sea-to-land transfer is affecting crops grown up to 10 miles inland from UK coasts, the authorities insist that the only pathway for the ingestion of seaborne radioactivity is through the consumption of seafood. They also disregard the certainty that the population of the coastal area is breathing potentially significant doses of radioactivity, particularly in the periods of strong winds.

A Continuing Experiment

In 1958, John Dunster of the UKAEA openly admitted that the authority had intentionally discharged "substantial amounts of radioactivity" into the Irish Sea to monitor how it would behave in the marine environment Dunster stated:"... the aims of this experiment would have been defeated if the level of radioactivity discharged would have been kept to a minimum." This experiment is continuing, though it has been grossly mishandled and the resulting data is totally inaccurate.

The time is now ripe for a review of "experimental" discharges of radioactivity into the environment. The industry should no longer be allowed to expand further, in complete ignorance of the realities of seaborne radioactivity and its effects on human health.

Tim Deere-Jones
This article is an edited version of the full article which appeared in The Ecologist Vol.21 No.1 (January /February 1991) This article quotes many references and I would urge activists to study the original in the Ecologist.

Russian Roulette

It should have been an idyllic scene. Across the river in the spring sunshine, a lush meadow led gently up to a cluster of old wooden cottages nestling under the woods. That was the picturesque Bylorussian village of Old Gromyko, by a strange chance where "Mr Nyet" was born—Andrei Andreyevich Gromyko, who was to become his country's long-serving foreign minister and later president.

On our side of the river lay New Gromyko, which had its share of picturesque wooden houses, but also a fair number of brick and breeze-block buildings. Down by the river two boats rested half in the water. A heron flew overhead—there are fish galore in the river. Behind a tuft of grass a black and white cat lurked hopefully, knowing that on boat held four small fish.

"See it off," Nikolai Gromyko (everybody is called Gromyko round here) told his four year old son Sasha, who waddled over to the cat, his legs so bowed that he could hardly run. It all seemed so normal. Sasha grinned. "I did it, didn't I?" he said as the cat ran off.

But if he stays any longer in this village, Sasha is doomed. Already his bow legs testify to a serious vitamin deficiency, He has heart trouble as well. His eldest brother has serious anaemia, and may be taken abroad for treatment — one of the lucky ones.

Sasha, his four brothers and sisters, his father and mother, are seven of *theonly 40 or 50 people left in New Gromyko, about 15 miles northwest of Gomel. In Old Gromyko there are only two - living in an intensely radioactive zone, fatally contaminated by the fallout from the Chernobyl reactor that exploded five years ago.

They should not be there. The government says that anyone living in a zone contaminated by 40 Curies per square kilometre or more must leave. Old and New Gromyko have 120 Curies per square kilometre.

So why are Nikolai and his family still there?

"We did move," he said. "I found a job as a tractor driver in a clean zone, but they paid me only 80 to 90 roubles a month. I couldn't feed my family on that, so we came back."

"Back here," where nobody should be living, the government pays people 30 roubles a month as compensation, so he gets 210 roubles. Not enough after the swinging price rises, but better than 80 or 90. So he sows radioactive potatoes and catches radioactive fish to help feed his family.

"What can I do?" he asked. 'If I take them away, they will die quickly of starvation. If I stay here, they'll die slowly of radioactivity." Nearby Bortolomeyevka is another ghost village. Doors and windows hang loosely from their hinges in a sinister silence. Windows are curtainless and blank, as if blinded by the radiation. In places radioactivity reaches 160 to 170 Curies per square kilometre.

The only things to be seen were a couple of cats, a mangy dog or two and some hens scratching at the ground — and then suddenly half a dozen old people were clustered round the well.

Nina Sokolova burst into tears at the question. "There is nowhere to go, and I'm so frightened," she wailed. "We can't use the well and now they have turned off the water." She pointed to a standpipe. "What are we to do?"

A lorry rumbled round the corner up the street. 'That's the bread lorry," explained Nina's husband Yegor through his few teeth. "It comes only once or twice a week now."

Nina sobbed: "We went to Gomel and asked at least for a room, and the boss just threw us out of his office."

Now 70, but looking nearer 90, Nina was taken to work in Germany during the war. Her husband fought in the Red Army, and they married when she came home. One son lives in Gomel, but his wife will not have them.

We drove away between rows on new solid houses. 'They were built a year or two ago," said Natalya Bobrovskaya, "and no one's ever lived in them. Last year they tarmacked the village road. Just think what they could have done for the children with that money. And last year they harvested crops."

Now the fields are deserted. But for several years radioactive meat from the Gomel region was being sold all over the Soviet Union. Five years ago, 70 percent of all the radiation from Chernobyl fell on Byelorussia and 53 percent of it on the Gomel region. The disaster caused more than 800 times as much fallout as from Hiroshima and Nagasaki together.

According to Dr Vladimir Pinchuk, head of the Children's Clinic No 1, the incidence of cancer related diseases has risen 20 -25 times in the past five years. There are thyroid gland disorders, leukemia, anaemia, lung cancer, deformed births, still births, you name it.

John Rettie
Guardian Weekly, May 5,1991

GOIANIA: THE BHOPAL OF BRAZIL

I September 1987 in the central Brazilian town of Goiania, a neighbourhood and its occupants were contaminated with caesium-137 after a lead box containing the stuff in powdered form was found in the ruins of a former radiation institute. (See *Anumukti* Vol.1 No.3). The box was taken to a scrap metal dealer, where it was opened. Apparently people were fascinated by the powder's luminosity and took some home with them and passed it on to friends and neighbours. The six year old daughter of the scrap dealer was so thrilled with it that she applied the powder all over her body. As a result of the contamination, 40 people were hospitalized and by October 28th, four had already died including the daughter of the scrap dealer.

According to the government's present figures, the box contained 19 grams of caesium and it contaminated 118 people in all. In addition it left behind more than 15 tonnes of radioactive waste that would need to be preserved for at least a century and a half. However, these figures are quite different from those which came out at the time of the accident. The reports had then claimed that approximately 100 grams of caesium was involved and at least 243 people were said to have been contaminated.

Whatever the government's figures, three years and four months after the accident, an investigative journalist, Bolivar Figueredo, found the victims abandoned by the state and federal authorities to cope with the difficulties arising from the accident totally on their own. According to an article published in *Agora SP* Figueredo reported that the foundation which had been created to provide medical assistance to the victims, had become practically defunct having received no assistance from the government for the last several months.

The Association of Caesium Victims has recently released a report entitled 'Three Years of Agony and Pain." It describes how people are presently categorized as being highly contaminated by the National Commission on Nuclear Energy (CNEN). The contamination levels are determined by the officials themselves and are based on who they have determined can hold someone else for a certain number of minutes "safely"—that is, without contaminating the other person. Among these highly contaminated victims are 45 children. The victims are badly treated and used as "guinea-pigs" by both Brazilian and foreign scientists. 'They stay for 10 hours inside a laboratory undergoing various examinations. Blood samples are collected and sent to scientists all over the world. However, when we ask for details regardingour situation, nobody explains anything to us at all," says Torezhina Fabiano, a member of the association and mother of two contaminated children.

In October 1987, one month after the accident, the radioactive waste was transferred to Abadia de Goias, located 20 km from Goiania. This hasty transfer was authorized by the regional government and the CNEN. At the time the waste was taken to Abadia de Goias, the official bodies had declared that this was a purely temporary measure-no more than three months maximum. However, even today no alternative has been established by either the CNEN or the Secretary of Strategic Affairs, whose duty it is to protect the security of the population of Abadia de Goias, even though there have been large number of complaintss regarding contamination.

Brazilian environmental groups have been publicizing the hazards posed by and the urgent need for maintenance of the radioactive waste deposit. Already, there have been complaints and accusations from the local residents. There are reports of mysterious deaths amongst cattle and other domesticated animals, who die alter loss of hair, nails and after a severe diarrhoea. As there has been no logical explanation and much less technical assistance, even simple scratches and wounds are being blamed on the caesium waste dump.

For the moment, the choice for the waste dump is still open. Brazilian officials have made announcements to the effect that the choice would be made within a month. However, when it comes to action, nothing is being done. The nightmare continues ...

WISE News Communique 354, June 14,1991

PROTEST

Greenpeace activists blockaded a train carrying two casks containing spent fuel rods at Dunkerque in France. The casks were to be loaded on board the train and passenger ferry "Nord Pas de Calais"at Calais.. Twenty people chained themselves to the casks and delayed the trannsport for 16 hours. Others painted skulls and the slogan, "Return to the Sender" and unfurled banners saying "Stop Nuclear Transport" in French, English and German.

In February of this year, the Dutch government has enacted a defacto moratorium on transport of nuclear fuel in ships such as the "Nord Pas de Calais", which are not specifically designed to carry highly radioactive freight. This moratorium makes Dunkerque the last port in Europe from which nuclear spent fuel can be transported on **a** non-purpose built ship.

Many groups, including Greenpeace have pointed out that the practice of shipping nuclear waste on non-purpose built ship is especially dangerous. The group also points out that the International Transport Workers Federation as well as the European Parliament have both passed a resolution calling for an immediate ban on transporting nuclear cargo on non-purpose built ships. But despite such calls, ships such as "Nord Pas de Calais" continue to transport spent fuel from reactors in various European countries to the port of Dover in UK. From there it is transported by rail to the Sellafield reprocessing plant on the west coast of Britain. In this particular instance, the spent fuel was from the German reactor at Unterweser.

Wise News Communique 353

Editor's Note:
Indian nucleocrats—the guardians of our safety—have been indulging in this practice of shipping radioactive waste in non-purpose built ships for long. Just before the gulf war began, they shipped a flask containing 40 irradiated elements of highly enriched uranium aboard a cargo ship "Vishva Parijat". This ship passed through the gulf two days after the beginning of hostilities. (See "Vices of Gambling" on the last page of this issue.) The irresponsibility of this action is enough to take one's breath away!

The transport of large amounts of radioactive waste which the decision to do reprocessing of spent nuclear fuel from abroad implies, needs to be seen in this light.

The Cat and Mouse Game in Iraq

I seems that even four months after the bombardment of nuclear facilities in Iraq, the picture of what exactly happened to those facilities and the nuclear materials stored in them is still not precisely clear. According to an official Iraqi statement to the International Atomic Energy Agency (IAEA), Iraq had tried to move its nuclear material out of the facilities at Tuwaitha before the expiry of Security Council deadline of January 15,1991. But it was "not fully successful" in preventing the destruction of all its nuclear material. "Nuclear materials had been shifted during the war from locations known to the Agency to near-by locations, thus avoiding the possibility of a nuclear accident and any risks including radioactive contamination. This was done under very difficult conditions, owing to intensive air raids against their original locations, which caused loss of life and equipment and exposure of personnel to high radiation doses." Sometimes the material was moved around from one place to another at Tuwaitha, but that location was also bombed.

Twenty-eight fuel rod assemblies (a total of 5.6 kg of the 80% uranium) was still under the ruins of the destroyed reactor. No radiation release has so for been detected from this fuel. First reports spoke about some 93% enriched uranium which was still in the Tammuz-2 research reactor when it was destroyed, but this was later denied. A nuclear material store at Tuwaitha, which was also destroyed, contained nearly 1,200 kg natural uranium powder and pellets, 771 kg of samples of natural uranium fuel bundles and 55 kg of natural uranium fuel rods containing 30 kg of nuclear material. All this material is claimed by Iraq to be covered by rubble from the store and Iraqi experts have noted "radioactive contamination of the region." IAEA officials are said to be puzzled by the contamination, since Iraq reported only natural uranium in the store when it was destroyed. Nothing

HIT LIST

Research reactor IRT-5000	Completely destroyed	Measurements do not show radiation leakage
Tammuz-2 reactor	Completely destroyed	Measurements do not show radiation leakage
Experimental fuel fabrication laboratories and annexes	Completely destroyed	Measurements show presence of radiation contamination
Separate nuclear materials store	Completely destroyed	Measurements do not show radiation leakage
Radiochemical laboratories	Completely destroyed	Measurements show presence of radiation contamination
Radioactive waste treatment station	Completely destroyed	Measurements do not show radiation leakage
Chemical research laboratories	Completely destroyed	
Chemical analysis laboratories	Completely destroyed	
Radiation protection laboratory	Partially damaged	
Nuclear physics laboratories	Completely destroyed	
Yellowcake production unit (Al Qaim)	Completely destroyed	

Source for this table: The letter of 27th of April from Iraq to International Atomic Energy Agency.

about the observed levels of contamination has yet been reported.

Almost 12 kg of 93% enriched fuel, four kg of 80 % enriched fuel, one kg of 36 % enriched fuel and 87 kg of 10 % enriched fuel was removed from Tuwaitha center to an unknown place nearby. Iraq says it is willing to inform the IAEA in "greater detail" after receiving "your guarantee" because of "continued violations of the Iraqi air space."

In the list of all nuclear installations (24 in total) the Iraqi authorities have sent to the IAEA, the yellow-cake production facility at Al Qaim, near the Syrian border, is the only installation mentioned that is outside of the Tuwaitha complex. This installation has also been fully destroyed. Rumours about a uranium hexafluoride conversion plant at Al Qaim are still unconfirmed; it is not included in the list. Also, no mention is made in the list of a centrifuge laboratory in north Baghdad, nor of a factory which makes centrifuge components northwest of Baghdad. Both had been cited by a German engineer who visited Iraq in 1988. There are supposed to be more facilities in the Jebal Qaras jok Mountains (near the Turkish Border). These are said to include a uranium mine and an enrichment plant. These locations too are not included in the Iraqi list.

The situation in Iraq has prompted discussions regarding the IAEA's system of safeguards. The discussion has mainly focused on the frequency of IAEA inspections but there has also been controversy regarding the definition of an SQ (Significant Quantity-the minimum amount of fissile material necessary for constructing a nuclear explosive device.) An SQ as presently defined by IAEA is 8 kilograms of elemental plutonium or 25 kg of elemental uranium-235. The official report from Iraq indicates that Iraq does possess more than one SQ of highly enriched uranium. Countries with SQs are inspected more frequently by the IAEA than the normal twice yearly inspections. So, if the IAEA knew that Iraq had more than an SQ of uranium, why were they not inspecting more often? On the other hand, if they were ignorant of the fact, it is further proof that inspections do not fulfill their purpose. In fact, after its inspection of Iraqi nuclear facilities in November last year, the IAEA had declared that Iraq did not have an SQ of highly enriched uranium.

But now, even the IAEA definition of an SQ has become a matter of dispute. The 25 kg quantity for uranium comes from a UN study of 1968. ONe official said that the IAEA took the Un figure over "because it doesn't have any weapons designers of its own. IAEA director Hans Blix has said that, "only the weapons states can competently answer the question of how large an SQ really is.

At the meeting of the IAEA Board of Governors in February, Blix said that the established definition of SQ "has important implications for safeguards approaches. If the tenet were to no longer give adequate confidence, it should be reexamined." However, if the SQ for highly enriched uranium were to be lowered to say half its present value, then more inspections by IAEA would become necessary according to its own rules. Already IAEA's inspection budget is under great pressure, and IAEA is rarely able to meet its own targets for inspection of small facilities such as those in Iraq. Also the decision will have great repercussions on sample size, since if SQ were to halve, inspection sensitivity would have to double.

Wise News Communique: 354

DEEP DISASTERS

Nuclear Warheads and Reactors Lost in the Seas

There are fifty nuclear warheads and eight nuclear reactors on the ocean floor as a result of 11 naval mishaps. Of these Soviet Union has contributed 43 warheads and five reactors whereas U.S. contribution has been seven warheads and three reactors. All eight reactors are sunk in the North Atlantic Ocean. A Soviet "Charlie"-class submarine which sank in the Pacific in 1983 and was subsequently raised is not included here. Of the sunken warheads, some 42 are in the Atlantic, the rest in the Pacific.

Unfortunately, this inventory of nuclear reactors and weapons may be an underestimate. It is not known if the Soviets have intentionally dumped decommissioned reactors in the oceans, or whether they have lost nuclear weapons in over water transit or during operations that did not involve the sinking of a vessel.

The New York Times of 27 September, 1974, reported that the Turkey's semi-official *Anatolian News Agency* said that a Soviet Kashin class guided missile destroyer exploded and sank in the Black Sea with no survivors sometime in early to mid September of that year. It has been reported by Greenpeace that Kashin class vessels can carry nuclear powered surface to air missiles and nuclear torpedoes. However, qualified sources at the time doubted that the destroyer was carrying nuclear weapons since it was on sea trials and in theory no such vessel would be carrying nuclear weapons.

On 7th of April, 1989, a Soviet Mike class submarine sank some 312 miles off the coast of northern Norway after a fire and explosions. According to Soviet announcement it was armed with two nuclear torpedoes. This indicates that Soviet ships do carry nuclear weapons even when participating in experimental or training operations. (The Mike submarine was one of a kind experimental submarine.)This makes it more plausible that there were nuclear weapons on board the Kashin class ship.

Similarly, the Royal Navy might also be missing nuclear weapons. During the 1982 Falklands War, Argentina sank two nuclear capable destroyers, the HMS Coventry and HMS Sheffield. Since then reports in the British press have repeatedly claimed that one or both ships carried nuclear weapons. These doubts have still not been definitely put to rest.

A List of Events

10 March 1956:

A U.S.Air Force B-47 bomber carrying two capsules of nuclear materials for nuclear bombs fails to meet its ariel refuelling plane over the Mediterranean Sea. An extensive search fails to locate any traces of the missing aircraft or crew. Where the accident occurred in the Mediterranean is still unknown.

18 April l959:

The U.S.Navy dumps the sodium-cooled liquid metal reactor vessel and the reactor plant components of the nuclear powered attack submarine USS Seawolf into 9,000 feet of water about 120 miles off the Delaware-Maryland coast. The *Boston Globe* reported on 17 May, 1980 that the U.S. Navy had been unable to find the reactor vessel and the barge with which it sank during a search in the 1970s. The Navy refused to give details about the search but merely claimed that by 1980 about 90 percent of the original radioactivity had decayed.

4 June 1962:

A nuclear test device atop a U.S.Thor rocket booster falls into the Pacific Ocean near Johnston Island after the rocket has to be destroyed as part of the United States' first high altitude atmospheric nuclear test attempt. The missile was destroyed minutes after liftoff and the debris fell into the open sea without a nuclear explosion.

30 June 1962:

A second attempt to detonate a nuclear device in the atmosphere fails. The Thor rocket booster is destroyed and the device falls into the Pacific Ocean. Although the official press release of the incident claimed that the "debris fell into the open sea and there was no danger to test personnel," a *New York Times* newsreport claimed that the missile was destroyed two minutes after launching and some of the debris rained back onto Johnston Island and another nearby island. The warhead was in the one megaton range and possibly contained a few pounds of either uranium-235 or plutonium-239. This hit the ocean in several chunks. Reportedly the ocean is three miles deep where the pieces sank.

10Aprill963:

The nuclear powered attack submarine USS Thresher sinks in about approximately 8,500 feet of water some 220 miles east of Cape Cod, Massachusetts, Killing all 129 on board. It was powered by one S5W nuclear reactor.

5 December 1965:

An U.S. A-4E Skyhawk attack jet loaded with a B43 nuclear bomb rolls off an elevator of the aircraft carrier USS Ticonderoga and sinks in 2700 fathoms of water about 250 miles south of Kyushu Island, Japan.

HAprill968:

A Soviet Golf class diesel powered ballistic missile submarine with three SS-N-5 missiles and probably two nuclear torpedoes sinks in the Pacific about 750 miles northwest of the island of Oahu, Hawaii in some 17,000 feet of water.

21 - 27 May 1968:

U.S. nuclear powered attack submarine USS Scorpion sinks 400 miles southwest of Azores in more than 10,000 feet of water, killing 99 crewmen. It was powered by one S5W nuclear reactor and carried two ASTOR nuclear torpedoes.

12April1970:

A Soviet November class attack submarine experiences a nuclear propulsion casualty while operating in heavy seas approximately 400 miles northwest of Cape Finesterre, Spain. After failing to rig a towline to a Soviet block merchant ship standing nearby, the Submarine sinks. It was powered by two nuclear reactors and probably carried two nuclear torpedoes.

6 October 1986:

A Soviet Yankee I class nuclear powered ballistic missile submarine with 16 SS-N-6 missiles (two warheads each) and probably two nuclear torpedoes, sinks 600 miles northeast of Bermuda in some 18,000 feet of water. A fire and explosion in the liquid fuel of a ballistic missile led to the sinking. The submarine was powered by two nuclear reactors.

7 April l989:

A Soviet Mike class nuclear powered attack submarine experiences fires and explosions and then sinks some 312 miles off northern Norway in approximately 5,000 feet of water. It carried two nuclear armed torpedoes. The Soviets claimed that the full content of the reactor's 17 kilogrammes of uranium fuel was spent and thus the reactor contained about two kilogrammes of plutonium.

Source: Neptune Papers No 4
Naval safety 1989:
The Year of the Accident
By: Joshua Handler, Amy Wickenheiser and William M Arkin

LETTER BOX

Letter from Goa

The National Meet of activists concerned about nuclear power gave a call for a strong movement against the Kaiga nuclear power station.

One of the significant issues raised at the meeting was that most of the nuclear power plants are situated near the borders of different states.

- Tarapur: Maharashtra—Gujarat
- Rawatbhata: Rajasthan—M.P.
- Kakrapar: Gujarat—Maharashtra
- Kaiga: Karnataka—Goa
- Koodankulam: Tamilnadu—Sri Lanka (Sea)

The damage caused in a nuclear emergency would seriously affect the neighbouring state.

For instance in the case of Kaiga, the Goa border is just 22 km away. According to Prof Shivaji Rao, environmental engineer of the Andhra University, in case of an accident at Kaiga, the entire population of Goa would have to be evacuated. It is therefore very important that the people of Goa take notice of this important aspect. The responsibility for evacuation will fall on the government in whose state the plant is located. Thus in the case of Kaiga, the Goa Government will conveniently absolve itself from all responsibility.

Essentially a watch must be kept against destructive development by the corporate world, which seeks to put people against people by getting their hard earned money locked into anti-people projects. Typical examples in Goa are Zuari Agro Chemicals and the Ramada Hotel, who in their attempt to get their environmental sins condoned, put in extra efforts to get the people of Goa to invest in their shares, debentures and fixed deposit schemes. Thus, when ultimately people protest against the environmental destruction and call for a closure of these projects, we will see our own brothers and sisters up in arms to protect these monstrous anti-people projects, since it is their money that is invested and they would need to protect their investments. Many of these people would otherwise be supporters of protest movement.

For those who are against nuclear power per se, it is important that they campaign amongst family and friends and the society at large, not to allow their money to be used for nuclear power financing. Next time you see promotional material calling for investment in the Nuclear Power Corporation through 9 percent tax-free bonds, remember Chernobyl and Kaiga and spread the message:

BOYCOTT NUCLEAR POWER BONDS!
STOP KAIGA NOW!

Roland Martins
Mapusa, Goa

NUCLEAR NOTES

Virtues of Insurance

After the Chernobyl accident international sea and transport insurance companies formed a "Nuclear Study Group" to investigate effects of serious nuclear accidents from an insurance perspective. According to Skandia - a Swedish multinational insurance company - "The results clearly showed that damages from a nuclear accident can be so extensive that the total capacity of the world's insurance companies is probably not enough to cover compensation." For this reason, insurance companies have added a new clause to sea and transport insurance policies that as of 1 January, 1991 excludes 'nuclear risks' from all insurance conditions.

The text from a policy dated 1 October, 1990 by Witherby & Co. Ltd. London reads:
Radioactive Contamination Exclusion Clause

1. This clause shall be paramount and shall override anything contained in this insurance inconsistent therewith to by or arising from
   1.1 ionising radiations from or contamination by radioactivity from any nuclear fuel or from any nuclear waste or from the combustion of nuclear fuel
   1.2 the radioactive, toxic, explosive, or other hazardous or contaminating properties of any nuclear installation, reactor or other nuclear assembly or nuclear component thereof.
   1.3 any weapon of war employing atomic or nuclear fission and/or fusion or other like reactionor radioactive force or matter.

From this text, it is not clear if the new clause includes accidents from transport of yellowcake and uranium hexafluoride, two of the most commonly transported radioactive materials. However, the Swedish Sea Insurance Association is more clear in its version, which states that there is no coverage for damages directly or indirectly caused by any radioactive product.

This does not however mean that the nuclear industry has been left without insurance. National governments and nuclear companies have taken on the insurance responsibility. The arrangements and the amounts of insurance vary from nation to nation.

Source: WISE News Communique 351

Vices of Gambling

A flask containing 40 irradiated elements of highly enriched uranium fuel which had been shipped from India was found to be contaminated with radioactivity when examined at Dounreay early in February. The contamination was discovered after the fuel had travelled nearly 10,000 km on an ordinary cargo ship, was driven by truck the length of Britain and lay at Dounreay for three days without any monitoring for radioactivity. The fuel was shipped from Bombay on the cargo ship Vishva Parijat on 24th of December, 1990 and passed through the gulf two days after the war began, although the authorities claimed that it had travelled through the area before the hostilities began. (See Anumukti's last issue)

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